The 240 year old problem of making macroeconomics a true science at last has been solved! Past macroeconomics theories have never properly modeled our social structure. Their over-simplified results are unsatisfactory, whilst more recent computerized models are unsuitable for student understanding. This book presents a scientific, compact, but complete theory about how our social system actually works, viewed from sufficient a distance so as to capture all of it, whilst providing a good picture of its various activities. The assumptions and definitions allow construction of a seamless model, logical in its development and complete. Details given are of the circulating money, goods, services and valuable documents, with many original ideas in the subsequent analyses. The book is suitable for students of economics who wish to avoid the confusion of past explanations. They should have some acquaintance with economics and high-school mathematics, to include elementary matrices and the notation of the calculus. This book is useful for teaching purposes, because of its more general terminology (with definitions) than before. The development also opens the way for research.
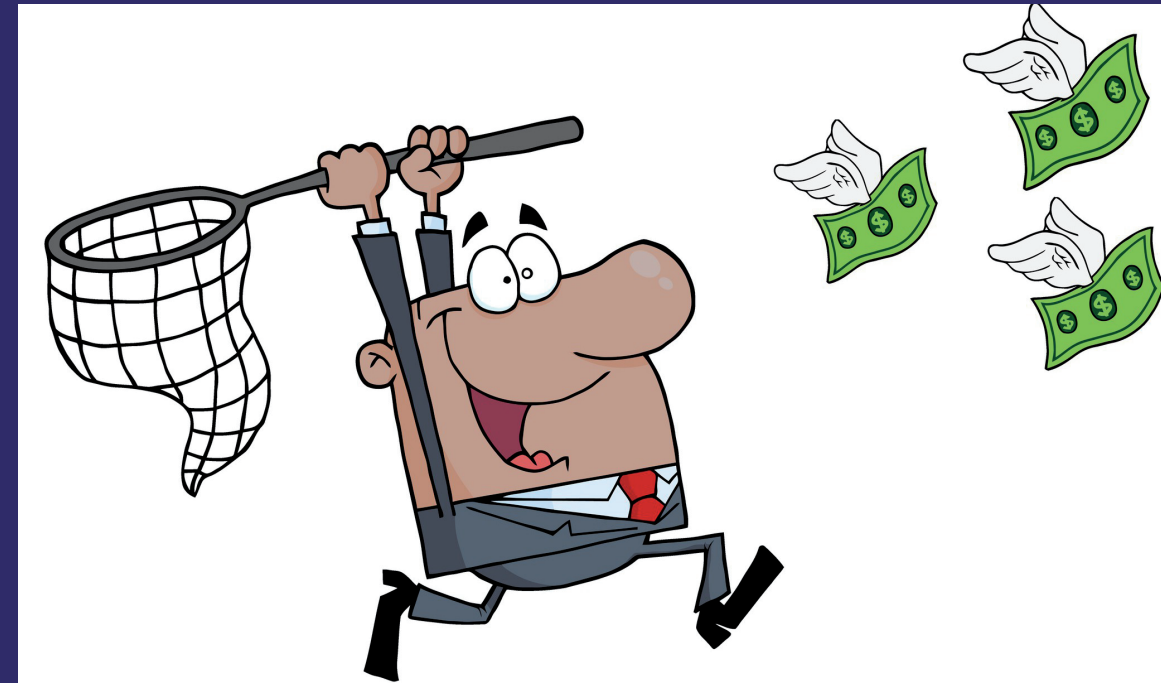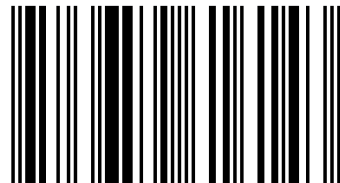
Consequential Macroeconomics

David Harold Chester

Student/Apprentice with British aircraft company 1953-1958. Aeronautics graduate--diploma of Cranfield UK, 1959, converted to MSc. in 1972. Studied macroeconomics at Georgist School and by self-study. Engineering career in AeroSpace, published 14 technical papers in international journals on related subjects. Retired 2008, currently writer

Consequential Macroeconomics

Rationalizing About How Our Social System Works

Chester

David Harold Chester

Consequential Macroeconomics

David Harold Chester

Consequential Macroeconomics

Rationalizing About How Our Social System Works

LAP LAMBERT Academic Publishing

CONSEQUENTIAL MACROECONOMICS

DEDICATION

This dissertation is in memory of my late father;

James (Braham) Montague Chester, (1907-2007)

who introduced me to Georgist economics.
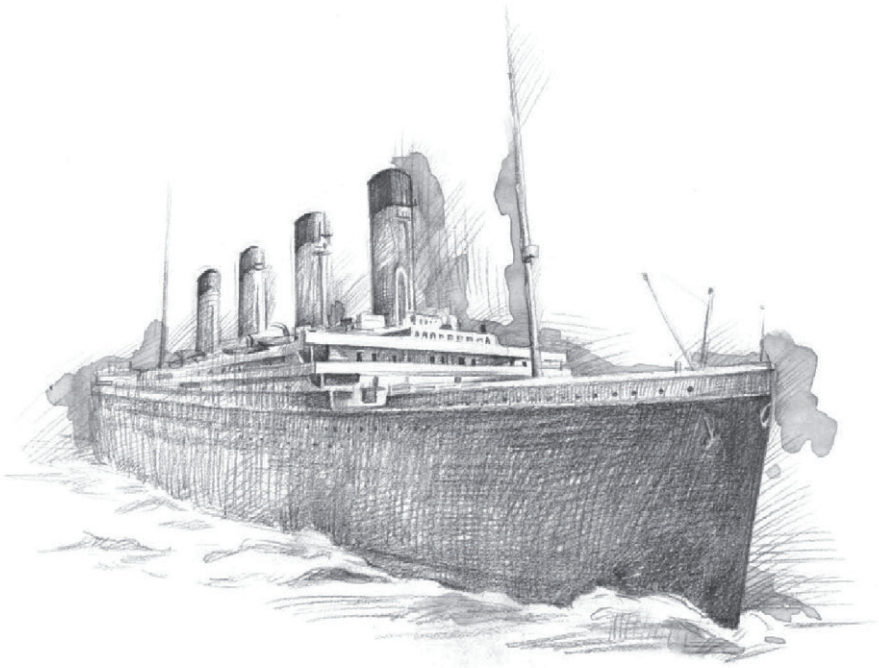
SHIP OF STATE

"The Republic" from "The Building of the Ship," by Henry Wadsworth Longfellow (1850)

Thou, too, sail on, O Ship of State!
Sail on, O Union, strong and great!
Humanity with all its fears,
With all the hopes of future years,
Is hanging breathless on thy fate!

CONSEQUENTIAL MACROECONOMICS

CONTENTS   page

Rationalizing About How Our Social System Works

List of Chapters   Page

CONSEQUENTIAL MACROECONOMICS

CONSEQUENTIAL MACROECONOMICS

Rationalizing About How Our Social System Works

LIST OF APPENDICES

Page

Rationalizing About How Our Social System Works

LIST OF FIGURES   Page

CONSEQUENTIAL MACROECONOMICS

LIST OF TABLES IN THE MAIN TEXT

LIST OF TABLES IN THE APPENDICES   Page

QUOTES

from "Economics In One Lesson" by Henry Hazlitt [19]

"The art of economics consists in looking not merely at the immediate but at the longer effects of any act or policy; it consists in tracing the consequences of that policy not merely for one group but for all groups."

"And this is our lesson in its most generalized form. For many things that seem to be true when we concentrate on a single economics group are seen to be illusions when the interests of everyone, as consumers no less than as producers, are considered."

"To see the problem as a whole, and not in fragments: that is the goal of economic science."

CONSEQUENTIAL MACROECONOMICS

MOTIVE - The Elephant and the Macroeconomics Problem

This book is about the re-capture of our knowledge of macroeconomics. It is devised because the writer regards the current approach to theoretical macroeconomics as being unsatisfactory and because he has something better to offer. The motivation behind the writer's attitude is due to the limitations and failures of past theories. Unfortunately they are unable to properly represent or forecast, to a reasonable degree of accuracy, the behaviour of our social system. The inspiration for this revised treatment comes from a heightened awareness of the physical and "on-paper" activities that necessarily are performed within the framework of our society. Consequently, by using a combination of macroeconomics with systems-analysis, related to that used in engineering, the writer provides an improved and logical means for the better understanding of how our social system works. This enhanced realization also is aimed at presenting a more general and comprehensive explanation about our society at large, rather than at entering into fine detail.

The present state of knowledge of Macroeconomics resembles the famous analogy of the group of blind men attempting to describe an elephant*.

---
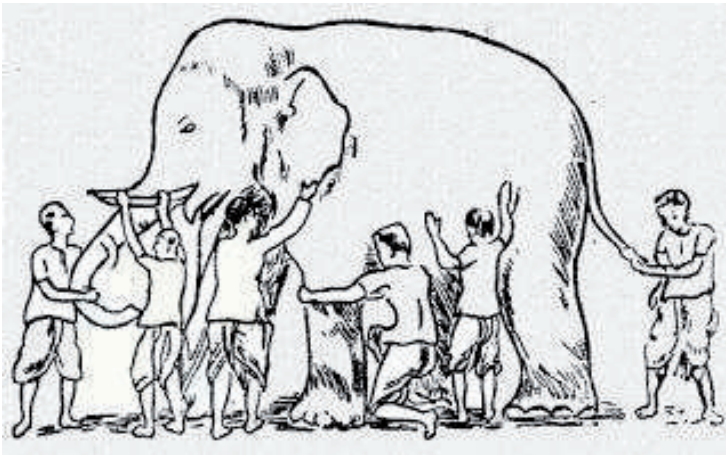
* It was portrayed by the American writer John Godfrey Saxe (1816-1887) in his poem "The Blind Men and the Elephant", based on a Buddhist fable in the Pali Cannon, Udana (Exclamations), Chapter 6, Section 4.

Rationalizing About How Our Social System Works

On touching its restless trunk, the first blind man claims that the elephant is akin to a snake. The second man, who handles the creature's leg, contends that it is like the main stem of a tree. The third on feeling the animal's ear, asserts that it is similar to a fan and so on. Each blind man is accurate not only as far as his description goes, he is even able to give an analogous explanation of the working of the specific feature that he has encountered. Yet collectively they are badly in error. Without the ability to envisage the full-sized beast as a whole, their reports of its nature are strikingly different and they widely elude the elephant's essential characteristic.

In common with this sightless contingent having poor ability to discern from afar, we too have been unable to perceive the holistic macro-economic mammoth in its true perspective. The past overall concept was just too much for our limited faculties to appreciate. At best, we could appraise but certain of its peripheral features that have become apparent as the state of knowledge about macro-economics developed (a subject which has changed its name more than once, having first been called "Political Economy" and later being known as "Political Science"). Subsequently a number of schools of thought were established. But the problem faced by students today is to decide which of them, singly or in combination, should be taken-up to better self-realize social macroeconomics as a whole--to obtain the most satisfactory concept of it, always with the presumption that the subject itself makes sufficient sense for this to be feasible.

The following list of aspects and theories in macroeconomics is intended to indicate the magnitude of this task of social self-identification. In modern text-books a number of these varied ideas are usually collected into sets. No two books or sets are the same and most authors favour only some of the following isolated views. Rarely do their works manage to achieve the true affinity of a logical, disciplined, comprehensive and well-established science.

LIST OF ECONOMIC CONCEPTS IN ORDER OF AWARENESS

a) The ability of the consumption of material goods to satisfy human needs.
b) The rights of property ownership, with the requirement for an accurate means of its valuation, for purposes of exchange and the fair award of compensation after damage.
c) The place of Political Economy within the Social Sciences (pre-classical approach by Aristotle [1]).
d) The "Laissez-Faire" attitude or the acceptance of natural laws, arising out of the 18th.century French Physiocrat's philosophy including

François Quesnay's "Tableau Économique" [2], but with Colonialism providing an important source of national income in practice.

e) Classical theories of the factors of production and the division of labour or specialization. The resulting advantage of the free exchange of goods using money, with minimal government interference, but with the help of an invisible hand from Adam Smith [3] and a marginal-rent rule by David Ricardo [4].

f) This Liberal approach becoming impractical. Use of new production techniques characterized by the "industrial revolution" in Britain, see historian P. Mantoux [5]. Due to the move of land-less workers to the towns, greater crowding and hardship. The persistence of poverty despite the growing wealth created by the huge advance in technical progress. Jean B. Say's Marketing Law, as described by W.H. Hutt [6], for goods-trading, rather than money.

g) Theories of monopoly, competition and of free-trade and the struggle to select the best national policy. Onset of the "business-cycle".

h) The banker's participation in the Capitalistic institutions of stock-trading, deficit budgeting, the issuing of National Bonds and the National Debt.

i) The Marxist Theory of Surplus-Value [7] with the equal sharing of this excess wealth using a socialist doctrine, Communism.

j) Henry George's theory of land monopoly and the claim for the creation of Equal Opportunity, through the equivalent of uniformly shared access to all of the natural resources, by his Single-Tax on Land-Values [8].

k) The concept of price-equilibrium, incorporating Alfred Marshall's [9] concept of supply equalling demand (in spite of various interpretations of Say's law that it precedes demand), with some "tâtonnement" (or groping) by Leon Walras [10].

l) Keynesian beliefs, consumption, savings and the multiplier principle, based on R.F. Kahn's analysis (the idea having been previously supplied by Frederick Bastiat in his satire "The Candle-Maker's Petition" [11]).

m) The beginnings of technical modelling of the macro-economy with neo-Keynesian modifications to suit the subsequent developments. Tolerance of inflation, after the abandonment of the gold standard.

n) Monetarist's theory of the banker's role, government by the issue of National Bonds and the alternative method of adjustment of the Prime-Rate of interest.

o) Production sector Input-Output modelling theory of Wassily Leontief [12] and the implied mathematical linear programming for simplified optimization of this sector as described by Robert Solov [13] with R. Dorfman and P.A. Samuelson.

p) Equilibrium Theory and Growth Theory, as expounded by J.B. Hicks [14] and the business-cycle (catastrophe) theory, using long-term dynamics.

q) A.W.H. Philip's empirical (and theoretical) relationship between unemployment and inflation [15]. The subsequent failure of this with the "stagflation" effect.

r) The statistical view of numerical forecasting, econometrics. The use of multi-variable models and the alternate time-series (single-variable) mathematical approaches.

s) Jay Forrester's "physical" simulation methods [16], using real-time state variables and feedback (as in Cybernetics and Systems-Dynamics)

t) MMT or Modern Money Theory—a recent approach by C.O. Roche [46].

Not all of these ideas are contradictory, but they certainly don't fit closely enough to make our macro-economic behemoth a living reality. There is also an emotional aspect that contributes to the difficulty. On the positive side, this awareness of any problem is largely due to our subjective feelings for it, a fact that is often taken for granted. But negatively many workers in particular macro-economic roles, become so closely involved with either their specific details and/or the implied political motivations that they fail to see the whole for the component parts. Those who are into politics actually will not see. They are self-blinded even to the possibility of there being alternative ways of envisaging the elephant.

Politics aside, a few years ago the dilemma appeared to be impossible to resolve and indeed this impasse still largely persists today. However, this state of affairs is not necessarily as permanent as our being blind from birth. Newer and better ways of thinking about macroeconomics are continuously being proposed and examined, as different kinds of specialists become interested in the subject. Perhaps a new combination of some of the more recent theories (whilst retaining a smaller number of past triumphs) could help? Or maybe some of E. de Bono's [17] "lateral thinking" techniques might be used in attempting to provide an innovation from the older approaches? Could a recent computational programme (along the lines of J.B. Shoven's and J. Whalley's general equilibrium [18]), provide some guidance to an improved understanding about the social system as a whole?

It is the writer's claim that by the use of engineering techniques, the problem can now be tackled in a better manner than in the past. These methods can help us to achieve a more logical, serious and practical representation of the entire macro-economic performance. In this dissertation he also sets out to show why he holds this view. The vehicle chosen for this universalization of

the theory is Functional Macroeconomics applied to a system of hypothetical elements, which will be explained below. There is good reason to assert that the Functional Theory to be presented in the following chapters is more comprehensive than the previously taken paths. It is not that it is revolutionary, but rather that it should be regarded as providing an improved focusing of the expression and re-solution of the various problems of the past. This new methodology has some rewarding features that are absent from those earlier schools of thought, whilst retaining many of their similarities and useful attributes. The particular attitude taken to macroeconomics that is highlighted here, arises from applying a Systems Analysis approach.

Interestingly enough, the difference between this and previous attitudes to our subject, is related to the two ways used for the preparation of technical specifications, by project managers and engineers. These planners can either define what the object should be like in appearance and nature, or specify how it should work when in operation. For relatively simple and stationary objects such as buildings, the first kind of specification was found to be sufficient, but particularly with the development of machinery a better method of specification is needed, that defines the various performance aspects of the device. The early schools of thought in Political Economy used the first kind of specification alone. They defined the place of the subject within the society, an attitude that was seen as being the correct approach to Social Science. Although later schools were less limited in the adoption of this viewpoint, the precedent had already been set. The descriptive aspects of these problems still followed the earlier format, even though they built more advanced but individualistic models, to represent the earlier ideas in somewhat more practical forms. However, these models could not be properly fused together into a consistent whole, due to the variety of materials and broad range of variables used. At best so far, the approach was descriptive with isolated working examples. Like the blind men's limited perception of the parts of the pachyderm, it was impossible to provide a full picture.

The alternate method of specification is to define what each macro-economic object actually does. In this form it is possible to simultaneously consider as a whole the integration of these various macro-economic actions, bearing in mind the common structure into which they fit. This concept of the combined functions does at least imply the existence of a full-sized image, although at this stage it is no more capable of providing the complete picture than before. However, it has some development potential that the previous visualization method lacked, in that it now deals with the usefulness of macroeconomics to

society at large, by the analysis of its elements and their activities. In a sense, the words have now been replaced by the deeds.

Although numerous simulations of the economy have been offered in the past, in the writer's opinion most of these have not started at sufficiently basic a level. Much of their context required assumptions that implied and/or presented the topic (perhaps unknowingly) according to the former descriptive method of specification. By following this tradition, the would-be simulators neglected to account for the more demanding but exacting definition of how macroeconomics works in practice as an integrated system. Such a system should be seamless and contain in its theory the smallest number of assumptions needed for the presentation of its general operation. As envisaged here, the fabric of our macro-economic system is woven in an orderly manner, which is the result of certain basic principles and derived phenomena, in much the same manner as that adopted for the other classic physical sciences. (This attitude is contrary to the statisticians and behavioural experts, who base their detached econometric realizations on performance aspects alone.) If needed, the approach taken here may call upon previous derivations of the operational aspects of the various sectors, but this is far from its essence.

It is hoped that the explanations to follow will ensure that these kinds of limiting assumptions are avoided. It is believed that in their stead this presentation will enable the reader to obtain a fair and general appraisal (and understanding) of the original but more universal approach to Macro-Economic Functions that is adopted here. Good perceptive ability like good government comes from experience, but it has to be learned just as a baby learns to "see"--by developing in its brain the ability to recognize visual patterns according to a self-programmed logic. In the same manner that perception is gained autonomously by the infant, the growing familiarity of the language and definitions related to these ideas will ease our ability to envisage the economy at large. What is presently obscuring our knowledge of the sociological reality will be cast aside; that which is missing from our image of the macro-economic world, ultimately will be brought into clearer focus.

In the chapters to follow, the approach to be adopted returns to certain basic concepts in macroeconomics which have lately been neglected after past interest was shown. Included with the more familiar material is the particular function played by natural resources and their special relevance within the macro-economic system. These aspects are re-introduced here. They are regarded as necessary features of the present analysis, which otherwise would be incomplete. Many of these ideas are based on the vision and

philosophy of the American economist Henry George [8], who wrote about them over 130 years ago and Henry Hazlitt's contention [19] of the need to take a more holistic viewpoint, 66 years later. However, the responsibility for their expression and delivery here is solely that of the present writer.

CHAPTER 1. INTRODUCTION - THE FUNCTIONING OF A RE-WORKED MACROECONOMICS SOCIAL SYSTEM (MESS)

This dissertation and study critically examines the broad manner by which our society is organized in the economic monetary sense. On a common and communal basis, all nations utilize some kind of Macro-Economic System, see Appendix A. However, it is found that the review and comparison of such systems can only provide limited guidance towards the general understanding of their operation. Consequently, it is an analysis in depth that is needed to derive a clear explanation of how the systems actually work. This approach specifically applies to the financial aspects, because implicitly the common measure of the systems' operation is by means of money. This also includes the way that the collection of taxes and revenues affects performance. Having initially stated these intentions, it will be appreciated that the key words in the title need definition. The title "Functioning of a Re-Worked Macro-Economic System" implies that at least four characteristic features require further interpretation. The additional tax and revenue aspects will be considered later, by their use within the text.

Firstly, **Macroeconomics** is the science of the production and distribution of wealth and its organization within our society, which encompasses the complete national economy. Presented on a grand scale, it provides knowledge about the panorama of means for livelihood and technological progress of the whole country, as it is directly related to the process of government. This study of macroeconomics evaluates the common and aggregate properties of the mass of useful resources and facilities that lie within the realm. Man was envisaged as a "tool-making animal" by Benjamin Franklin (1706-1790). The logical extension of this concept favourably relates to all of our useful economic activities in the biosphere of planet earth.

Such an attitude suggests that our subject should be examined in the most general terms possible. But to obtain this wide field of view, an appropriate macro-economic observer must be remotely located. Unfortunately he/she cannot then be expected to discern the progress of discrete workers, firms nor even specific industries, which flourish within the finer scale of microeconomics. However, the distant perspective adopted does not mean that the effects of the ensuing business transactions are insignificant. Our monitor's limited power for the resolution of details is because these frequent actions occur at such close proximity within the macro-economy, that it becomes impossible for him/her to register them all. Even if this were achieved, the impression that the observer would then receive, becomes so

complex and confusing that he or she would loose sight of the full picture, nor would an assessment of it be possible.

Actually, this dilemma and the resulting necessarily limited approach to the problem are not so unusual - to appreciate a tiger-skin carpet one need not examine each hair and the art of generalization (on which mathematicians so greatly depend) is also pertinent in our situation. As in the case of modern painting styles and in other forms of creative expression too, it is particularly by viewing the subject in this broad manner that one can discern new characteristics. Similarly in our situation, certain aspects are not apparent when one concentrates on the nature of a single line of economic activity. Hence, the universal "impressionist" kind of perception technique that is being adopted here, deliberately omits much of the micro-economic detail.

The use of the term **System** in this context implies that a number of basic elements exist and are in communication. Such elements as these are known to occur within the common macro-economic structure, which readily may be analyzed when using this insight. Having previously excluded individual workers, firms and industries from consideration, our system never the less retains certain general properties that determine its operation and relate to the location of its more-specific features. In the tiger-skin analogy, one can easily detect which different kinds of fur once covered various parts of the beast. Similarly within the actual macro-economy are to be found specific but diverse kinds of activities, expressed in the separate roles played by large and identifiable entities that are able to provide useful conceptions and can still produce significant results. A poetic description of a system is presented in Appendix A, with some additional comments that apply to the particular kinds of Macro-Economic Social Systems (or MESS) of our current concern.

When it comes to analysis, it is implied that the system of the macro-economy should be examined by the same method as that used for others systems of inter-related elements--the techniques being shared with those who devise complex self-regulating arrays. This situation is found in industry, on a managerial inter-departmental organizational scale as well as in the design of specific products that provide a degree of autonomous control of their behaviour. Automatic machines are in this class, which employ servo-mechanical controls to guide their motion; a common feature in various types of land, sea and air transports too. This kind of control is also used within many production facilities in industry, which are designed to provide an inherent capacity dedicated to meet a particular performance goal.

Rationalizing About How Our Social System Works

To appreciate macroeconomics it is therefore an advantage to know very broadly how these systems behave during their operation. This analysis requires the introduction of both systems-engineering and cybernetic activated decision-making. Hence, the engineer's and the manager's approaches together play a useful role here, as in the Policy Analysis Modelling of Di Cesare *et al* [20]. Some of the simpler and more obvious methods by which these two kinds of technologists execute their tasks, are employed below.

However, it is by the use of the word **Functioning** that this treatment really breaks new ground. The classic texts on "Political Economy", as the subject was once called, used word-based analyses of a philosophical nature. There it was assumed that society comprised different classes of people, whose various economic activities are combined to produce, distribute, consume, invest or speculate in, accumulate and hire out the resulting wealth and opportunities, in order to obtain more purchasing power. At a relatively early stage these writings claimed and adopted a "scientific" attitude (in a Victorian sense, which incidentally is not the same as the present-day meaning of the term, see below). That approach carefully defined the factors of production (see Adam Smith [3], for example), but failed to properly include in the analysis, the remaining structure of the macro-economy.

In particular, no distinction was made between the social positions that are held by individuals in the community and their useful activities (or economic functions) within the medium of macroeconomics. If we are to ascertain how the system works then it is important to separate these two aspects of our society. Not only is it essential to define the kinds of material goods acted upon and the means by which this action occurs (as was done in the past, using the principle of cause and effect), but also to specify the type of agency whose unique actions directly lead to each particular result (or output). Without making this distinction between the two classes of definition, the contentions for example that:

> house-holders take-out mortgages on their homes, or that
> capitalists are leaders and controllers of industry, or that
> land-owners use rents to improve their living standards,

will continue to confuse us when we contemplate the subject, which is already over-laden with too many complications. In the format presented below, none of these three idealized agents (as aggregates) can characteristically perform these specific actions, mentioned above. Instead, proper definitions of their functions (with suitable symbolic notation) are provided in Chapter 6 and more specifically in Appendix B.

CONSEQUENTIAL MACROECONOMICS

This separation of the concepts of social standing from economic role means that the operation of the MESS can now be expressed as a specific set of transformation and trading routines. Hence use of the expression **Re-Worked** in the title, indicates the result of this partitioning that was lacking in the original method of viewing the Political Economy. Then the loan and/or exchange for money of consumer and durable goods, services, valuable legal documents and access rights, can be prescribed in a logical manner that avoids the possibility of error and confusion. An actual home-maker whose economic activities are likely to include: his physical labour, the employment of others, the management of property, partnership in a firm, extension of credit, ownership and the use of land, support for Government policy and petty philanthropy - are now isolated, as a set of various specific tasks. Each is taken here as an independent action that is not performed solely by one kind of person. Instead, the action is considered here to be uniquely executed by a specific type of functional entity.

The fact that a greater degree of order and more meaningful explanation is possible by divorcing the social and functional aspects of society, is a matter that many economists from older schools of thought may not gracefully accept. With the approach taken here, the resulting simplifications enable the subject to become more obvious and the past traditional (and vague) ways of describing the overall situation cease to be of such great significance. It is felt here that the price to be paid for introducing a little logical analytic engineering and mathematics into the world of the sociologist-economist, is not too high. Indeed it is hoped they can also manage to re-consider the subject when it is expressed in this manner, as an agreeable alternate to their own previous terms and prior claims.

By choosing to define and to elaborate on the title words of this chapter, the writer has aimed at the realization of a better way to approach the subject of macroeconomics and to describe and explain its operation. As a result of and bonus to this greater knowledge, there is created an enhanced awareness for making improvements to our system. These matters are illustrated later, when the effects of various kinds of taxation and other means for the collection of the Government's budget are examined in greater depth.

Rationalizing About How Our Social System Works

PART 1. GETTING STARTED   Page

CHAPTER 2. PRELIMINARY REMARKS

2.1 The Changing View of Macroeconomics

By tradition, the subject of macroeconomics is regarded as an inexact social science, where the early thinkers used their intuitive and reasoning powers to explain the working of the national economy. These theories were expressed by descriptive writings - their authors being inclined to add their philosophical/political views rather than the more-scientific ones. Due to the limitations of this medium for thought, macroeconomics was treated in an imprecise manner and the subject developed within the field of the humanities, rather than as an exact science. The most general considerations about macroeconomics as described in these classical texts are summarized below.

It appears essential for our economic activities to proceed according to the following pre-condition. Using the Earth's abundance, the continuous consumption of the goods that are produced, enables us to incompletely satisfy human needs and desires, (that fall within the classes of security, life-support, physical comfort, reproduction, social-status, spiritual well-being and the search for greater happiness). This economic production of an insatiable range of produce involves the application of a minimal amount of labour to the natural resources, by the use of tools and other forms of capital investment. Within our communities the development of working skills and specialization, results in the need for and advantage in the exchange of the various products, within the society. The tendency to be prudent in expenditure encourages a competitive spirit and leads to a higher degree of economical efficiency and benefit as a whole.

On the other hand, due to the established rights to the ownership of property, there is also a strong motivation and trend to monopolize the use of the natural resources together with many of the productive techniques, capital investments and the resulting wealth. Even so, the development of a lawful and orderly society within a practical macro-economic framework has enabled a mostly appropriate and peaceful use to be made of the raw materials, labour, surrounding land, acquired knowledge and working capital (albeit in a somewhat unjust manner). But without this social structure we would be less fortunate than wild animals, whose survival depends solely upon instinct and the law of the jungle!

(As a very human gesture, in order to somewhat compensate for the unfairness of this monopolistic reservation and withholding, the two concepts

of individual charity and of national welfare were subsequently introduced. However, these ideals have made but small inroads into the monopolist's fortress and regardless of Socialist claims, they are unable to fairly compensate for what in essence is an unjust though strangely practical social-managerial arrangement.)

Whilst pleasing the sociologists, it is scarcely realistic for our present view of macroeconomics to be constrained within this category of human affairs and relationships, for the following reason. If Man is to be considered here only as a superior kind of gregarious animal, which is active in a benign environment, then the growth of his civilizations must be attributed solely to brute cunning. His use of muscular power in the production of agricultural goods and local crafts, followed by their exchange by barter, might once have been regarded as merely an extension of nature. However the invention of money and banking, the introduction of a centralized Government and the progress in developing efficient transportation, rapid communications, mass-production, heavy industry and the preference for dwelling in large communities, have transcended that era when those more rudimentary means of earning a living were typical. The complex structure of today's well-developed macro-economic society and system is artificial in essence, and it rightly falls within the growing field of applied science and technology. Hence the subsequent need to analyze increasing amounts of data causes the macro-economist to realize that his subject is not so far placed from the exact sciences as it was once presumed.

The human talent for specialization and coordination has in general separated the resulting economic productive activity into five consecutive steps. These are: social-organization, demand-realization, planning-design, execution-manipulation and finally distribution-exchange. For example, within industry these particular tasks are undertaken by employees in the management, marketing, engineering, production and sales departments, respectively. As the technology developed, this process became more refined and effective, although these basic divisions still are retained. Whilst many of these activities appear to be divorced from nature, there clearly remains a need for her participation. If for no other reason, this is because all goods and produce originate in materials, plants and animals that are obtained from the earth's surface and its immediate surroundings. Also no economic activity can be performed without occupying a suitable work-space. The relevance of these two resorts to nature is explained later, where the term "land" is adopted to cover all of the natural resources.

2.2 The Call for Analysis

With the steady evolution of improved means for the production and distribution of wealth, a new difficulty arose. Modern governmental master-planners badly needed accurate macro-economic forecasts. They also required the ability to conduct "thought-experiments" for the evaluation of new policy. It therefore became necessary to express the associated theoretical models and analysis in a more precise form which was amenable to study by simulation techniques. Although the earlier macro-economic theories were later modified to contain mathematics, they were still based on the immature and partly intuitive philosophical approaches of the past. These reworked theories were unable to cope simultaneously with all the complicated effects that had been found. Consequently the main-stream of economic thought was virtually forced to adopt a new concept, econometrics. Here it was claimed that more accurate forecasts could be projected by using detailed mathematical models, based on statistical data about past behaviour of the macro-economy. Unfortunately in practice this was found to be only partly true, and the previous inability to identify sudden changes in future trends, was not rectified, as shown by R.S. Pindyck and D.L. Rubinfield [21].

Statistics aside, the assumptions associated with the newly devised algebraic formula (that emerged when using these techniques), were largely taken from refinements of the previous theories. It was done without the formality of an exact-science attitude of cause and effect, the assumptions not being properly stated before the equations were cast. (The resulting expressions do not appear obvious, unless one is very familiar with the alternative theories and associated political philosophies). Had these early theoretical bases been properly examined, it would have been discovered that there were good reasons for rigorously reworking them - to fortify this recent discipline, instead of making it more obscure. Otherwise it would also have become clear that the ways of thinking about the system and the analytical techniques employed are common to both economists and engineers. On theoretical grounds too there is a need for macroeconomics to be treated within a physical/scientific context. These kinds of logistic discoveries could usefully involve the (joyful) sharing of the analytic methods between various disciplines, which is typical of today's treatment of many other technical subjects.

When economists simulate the economy (in order to study its variation with time), the resulting mathematical models already bear a resemblance to the dynamic systems created by design engineers. Now the role of engineering is essentially one of adapting scientific findings and techniques to refashion

nature so as to better meet human need. The complicated arrangement of the national economy should consequently be amenable to the kind of analysis that was previously applied to the interconnected, variable and functioning logic-elements of mechanical, electrical biological and even ecological arrangements. Systems-Engineering is the discipline that has been developed for this class of static and dynamic situations and it clearly is applicable to problems within the macro-economy too. In its broadest aspects, this is the approach to our subject that is presented below.

2.3 The Significance in Taking a Scientific Attitude

From the earliest stages in its development as a formal subject, the writers in political-economy (and later in macroeconomics) claimed the need for and use of a more scientific attitude, to what began as a somewhat imprecise aspect of sociology. However in practice, the way that much of macroeconomics are treated is still far from being sufficiently scientific. During an interview, Nobel Prize Winner Dr. Richard P. Feynman explained: "Because of the success of science there is I think, a kind of pseudo-science. Social science is an example of a science which is not a science", see his book "The Pleasures of Finding Things Out" [22]. In order to rectify the situation as described by Dr. Feynman, we will take a similar attitude to the need of being more scientific, with the enlivening difference that it is useful to first determine what is implied by adopting such a fully scientific viewpoint.

The expression "being scientific" means that one is applying a logical* systematized method in the study of the particular subject. Of course this is with the provision of first having sufficient motivation and the ability (at least in a rudimentary technical sense) to question, recognize, classify, retain and recall the emerging realization and understanding of the relevant aspects of nature and society, for the situation under investigation here. Then the various stages of the scientific method are (on following page):

---

* Logical – with the use of a minimum number of assumptions and stages in the analyses, according to the philosophy of simplicity, known as "Occam's (or Ockham's) Razor", see A. Baker [23], apparently by William of Ockham 1285–1349. This refers to the result after throwing out any unnecessary detail during the development of the theory, with the aim of obtaining a clearer identification of only what is relevant, thereby providing for an improved understanding of the remaining components and procedures.

CONSEQUENTIAL MACROECONOMICS

1. Awareness of a particular event, phenomenon or facet of nature and the empirical knowledge of its reliability. This implies the existence of a suitable language of expression for various concepts about the subject and its development. It also suggests the initial taking of an inductive approach for explaining the event etc., although this process is archaic and undesirable at the subsequent stages.

2. By thinking logically about the cause of the event and the use of deductive reasoning for the supply of a hypothetical explanation of it, after the rejection of other less likely ones. (The candidate theories start off as being intuitive, without much organized thought having been put into their selection.) The significant but limited achievements of the social science of the Victorian era, Karl Marx [7] being typical, never got much further than this. For all their profound intentions, they owe little to the methods of science that follow.

   The more successful explanation of the phenomenon should contain and formally postulate a workable theory about how and why it happens (possibly, but not necessarily including the use of applied mathematics, as a tool for improving the degree of understanding). At this stage the theory is often called an analysis, which strictly it is not. The current state of much modern macroeconomics has been halted at this point, due to the limited breadth of the assumptions, including the use of the infamous and restricting claim of "all other things being taken as unchanged" (*ceteris paribus*), which is unrealistic.

3. Due to doubts about the unproved theory (which is regarded as imperfect but capable of enhancement), a critical test case is designed. This is run as a trial or experiment, to confirm that the theory is sound or to show up the places where it fails. It is then mandatory to accept the results however surprising they might be, provided that the experiment was performed with sufficient care and accuracy. (The inevitable introduction of experimental errors implies that due allowance must be made before comparing their results with the theoretical predictions.)

   As an alternative, particularly in circumstances where an actual experiment is impracticable, it is possible to construct theoretical models that represent the operation of the subject being investigated as a system (see Appendix A). The input (stimulant) produces an output (response) by the cause and effect logic, as used in classic physics. One can then compare what the model predicts would happen in specific circumstances taken from the past, with what actually did occur. This kind of simulation is not as

satisfactory as the planned experimental procedures, but it can supply an approximate measure for the ability of a particular theory to fit the facts.

4. Replacement or refinement of the theory, in the light of experience gained from making these tests and simulations. Some of the previous stages may need to be reiterated several times. This is both in the quality of the language used in the adopted theory, as well as by making improvements to the technique for its proof. These developments result from experience and greater skill in their analysis. It is the growth of these disciplines that teaches us about the science (and not the reverse), as they add to our knowledge about it.

5. The introduction of a related philosophy along with the current theory, being used to describe and explain of the nature of the basic phenomenon. By this means, the level of awareness can realistically envisage and combine the factors leading to the phenomena. At this stage the scientific approach begins to bear fruit.

6. Ultimately, the synthesis of various theories (and their associated philosophies) for a number of related phenomena in nature, to produce a more-general unified theory. This provides a tidy, refined, precise and comprehensive expression of the broader scientific achievement in better understanding the subject matter. The acquired state of knowledge now reaches the mature level of providing a good sense of reality, with some ability to make general forecasts.

Certain aspects or implications from the above stages in the scientific process apply to our macroeconomics problem, and in various places that follow the use of some of these steps is to be expected. The scientific approach presented above is not intended to confine the process of inquiry, but rather, it is aimed at guiding it along the most beneficial and useful lines, for providing a better explanation and understanding of the subject.

As seen from Dr. Feynman's comment above, many of the past explanations about macroeconomics have been written in a somewhat unscientific manner, so that our subject cannot be regarded as an exact science in the same way as are physics or chemistry. Indeed it seems that there is a general conflict between macroeconomics and science. Why is the subject of macro-economics explained in such an inexact way, and similarly why do scientists give so little regard to being economical in performing their research? Surely this disagreement needs to be resolved, before any serious developments in macroeconomic theory can take place. Although Mark Twain's comment about the pursuit of science being most worthwhile because the results are so

much more easily obtained compared to the effort otherwise needed, the application of this approach to macroeconomics appears to be impractical, whilst the latest kinds of scientific studies in cosmology, particle physics, biology, medicine etc. are currently absorbing enormous amounts of money.

Surely there should be some place where science and economics can meet without their natures being so extreme and incompatible? In more mundane and practical matters, the way that this happens is by the help of the engineer, whose work and achievements are a combination of applied sciences, normally within the constraint of a strict budget. For this reason it should be no surprise to the reader to find that the author of this book is an engineer, whose profession left him with sufficient spare time for the entertainment of these macroeconomics ideas. Consequently, the expression of the theoretical macroeconomics to follow, adopts a systems-engineering style of treatment.

2.4 MESS Modelling Aspects

As mentioned above, a planned experimental approach to this subject is impractical. Instead, there is an inherent need to start to create theoretical models, because we want the ability to envisage the situation in a form that can be tested by simulation. This approach is adopted below. It is not a difficult procedure - in fact we all practice it whenever we try to convince others about a specific thing or situation, without our even being aware of the technique. Consequently, the trend towards modelling is a natural response, aimed at advancing our knowledge of macroeconomics beyond stage 2 above.

However, our chosen subject is too complex to be treated as a single natural phenomenon, amenable to the theoretical methods of pure science. What is required is an engineering approach (having methods that are practical, if somewhat less academic); to be adopted as the vehicle best fitted to carry the subject forward, when taken as a whole. Systems engineering can consider the combined actions of several kinds of operators and this kind of methodology will be employed here. The fact that this has not yet been achieved in macroeconomics may be largely attributed to the self-inflicted blindness, of the type with which the description of this dissertation commenced, as described in detail by M. Gafney and F. Harrison [24].

Past attempts to construct macro-econometric models by R.S. Pindyck and D.L. Rubinfield [21] have suffered from three kinds of difficulties. Either they

become so complex that it is difficult to understand what is going on and hard to extract useful knowledge of a general kind about the social system. Alternatively the model is over-simplified by not including sufficient of the "big picture", with the result that the implied assumptions are too limiting for a general answer to be acceptable, as in R.D.G. Allen's well-known book on theory [25]. Another alternative approach that uses statistical methods in the modelling, shows time-series variations, usually of a few variables. However their variations are based on past performance and the assumption that future behaviour can be based on it. This is not necessarily true and it is inaccurate to make forecasts using these models.

When he considers the working of a complicated real-life situation of this kind, the engineer first envisages it in the form of a system that can be examined for:

a) aptitude for operation, (the possible variations in the freedom of movement, or its kinematics),

b) attainment of equilibrium, (the steady-state or homeostatic condition of W.R. Ashby [26]), which the inherently stable but imperfectly balanced system normally tries to reach, when left to itself for a short time and

c) experience of dynamic changes after a significant external disturbance has occurred. The resulting fluctuations are more violent than for b) above, and they continue over a longer period of time.

The actual system may be represented by a compound theoretical model that combines a number of relatively easily represented and understood model elements or parts. Each part has particular (and familiar) physical properties that are simulated after building the associated mathematical expressions. A separate analysis can be applied to each one, which has a specific purpose and behaves in a characteristic way. The combined model is then used for simulating the whole system, when the responses of all the parts allow it to achieve equilibrium by reason of its inherent stability. Ancillary parts can be added or removed from the system without it breaking down, provided that these modifications do not seriously alter the most basic parts of its structure. Outside changes can be introduced, that disturb the model before it reaches an equilibrium condition, even though it is possible that they will never allow that completely stable state actually to be achieved.

For example and by analogy, the human body can be conceived as a series of structural, mechanical, hydraulic and communications-network sub-systems representing respectively the bones, the joints and muscles, the

circulation of the blood and the nervous system. Although it might prefer to remain at rest, depending on the demand for physical activity these various parts of the body's system must work together at rates that correspond to their various demands, in a controlled and coordinated manner. The engineering approach to the "body politic" is also to construct an idealized model that incorporates its relevant functional features. In fact this is an extension of the classic analogy "Leviathan" of the 17th. century philosopher Thomas Hobbes [27].

The MESS model that is presented here is also intended for use in simulation. Without this capacity it would be hard to justify its truth or to substantiate its practicality. Although the state of the art in modelling macro-economic systems has undergone considerable development in recent years, the modelling processes used by economists have not yet been subjected to this kind of rigorous engineering approach and discipline. In this study an attempt will be made to rectify this situation, without entering into too much detail. Greater light will be shed on the general structure of the system by returning to some of the basic modelling concepts and assumptions, whilst taking an alternative and more exact approach to the overall problem.

2.5 The Relationship to Classical Physics

With the introduction of more rigorous and scientific techniques to our subject, it should not be surprising that the nature of the macro-economic system envisaged below, resembles that of other kinds of models in the exact physical sciences. Our system shares with them a logical base that includes the "cause and effect" philosophy of these disciplines. This comes from the use of elements, having specific measurable properties, which are related or interconnected in the manner of a physical system. Also in common with other physical systems, there are shared mechanical, electrical, hydraulic or other analogies between them* (that aid in the human thought processes about them, as well as in their computation).

These systems obey universal laws of behaviour, which apply with great accuracy over a wide range of scale. Where there are exceptions, sometimes noticed at very small or exceptionally large sizes, pressures, temperatures etc., these can be explained by the need for modified assumptions in the particular circumstances. (However, these do result in a few strategic changes to the subjects' modelling, which strongly affect their conception, visualization and performance.)

* see next page

* The tiger-skin carpet conceptual analogy used in the Introduction is a case in point. Another way of envisaging our macro-economic system is to compare it to the physics of the Gas Laws, which relate the pressure, density and temperature of an ideal gas. These laws are derived from the individual molecular characteristics of the gas. Each molecule has random motions but on average they are shown to possess certain general properties. Similarly, the mass of the population of a country responds collectively to economic change in an aggregate manner. The only problem here is that as "molecules" ourselves, it is difficult for us to appreciate the overall situation! This is the difference between Micro- and Macro-Economic thinking. It is a barrier to macro-analysis needing to be overcome, see Chapter 17.6.

CHAPTER 3. ASSUMPTIONS

Although this chapter is aimed at formally introducing the basic assumptions used in the analysis, the process of their selection contains some inherent logic. In fact these assumptions are implicit in the "design philosophy" that characterizes the approach being taken here for examining this system. This is due to our initially adopting an engineering attitude to this social order. Therefore, it should be no surprise to find that the more detailed-assumptions are conditioned by this basic approach. Then it is not difficult to appreciate that the analysis is aided rather than suppressed by the assumptions, despite the use of "descriptive mathematics".

3.1 Aggregation

In order to exactly simulate the complete set of individual transactions within the entire system, an analyst would need to include the separate actions of each household, business concern etc., for every purchase, banking loan, tax payment and rental. Here, the daily micro-economic variations are a matter of individual choice. Even if this kind of representation really was intended, in practice this behaviour could only be modelled for the full economy by using statistics (and pseudo-random functions). So the analyst would still need to use data based on averaged properties. Consequently there is no advantage in depicting any greater amount of detail. Whilst many alternative modelling possibilities still remain, it must follow that various properties of certain broader combined features of the system will provide the only truly useful outcome. Then the use of aggregate quantities as variables is an "assumption" over which the analyst has virtually no choice,

This concept also comes with the premise that it is preferable to model the MESS using algebraic equations having these aggregate quantities as the variables, because it is impractical to physically simulate each individual action. The natures and definitions of the 3 kinds of these equations suitable for this work are as follows:

Identity Equations - comprise of the items on the accountant's balance sheet. These incoming and outgoing money-flows define the state-variables in terms of the sum or difference of several of the others. Consequently all the terms have coefficients of unity, although the variables themselves are time-dependent. These equations form the main structure of the system and as such are fundamental.

Technical Equations - represent the relationship between these state-variables of passage, according to the internal functioning of the entities. These equations are characterized by dimensional coefficients that convert from one kind of state-variable into another, often with the use of mathematical expressions. These technical equations are universally true, including rates of change of the variables but without containing any second or higher order functions of the elapsed time.

Behavioural Equations - represent the way that the state-variables within the entities respond according to their previous history. These equations cannot be derived from pure theory. Instead, the system's behaviour is expressed by equations having time-dependent coefficients, as determined by their past performance and econometric (statistical) analysis. The coefficients are imprecise and may themselves vary over long time periods, due to imperfections in the associated modelling details and particularly in their limited capacity to properly represent large changes.

3.2 Sectors and Various Improvisations

Instead of attempting to track individual influences on the progress of the whole system, it is easier to follow it by collecting these factors it into a number of sectors, each having certain commonly identifiable features. This involves the concept of presenting the data in many-varied sectors or branches, through the introduction by C-S Yan of Input-Output Economics [28], which aimed at studying their relative performance by simulating the sectors in detail, as they might appear in a "physical-arrangement" model. However, this approach also results in a duplication of the sectors' activities that contain many similar properties, the sole differences being in their proportions and not in their ways of working. These aspects make the model unnecessarily complicated, and tend to obscure some of the resulting behaviour.

To avoid the problem of duplication, the use of a drastically reduced number of sectors also was tried, unfortunately without bothering to view the system as a whole. This popular approach, typified by K. Patterson, *et.al.* [29], produced models that simulated only parts of the MESS, with the risk that some of the important effects might have been omitted. In order to construct and use such a model, it was necessary to compensate for this by the introduction of boundaries in the form of exogenous time-dependent functions (behavioural equations) and by statistically determining their coefficients. With this method, the results were only as good as the accuracy of the improvisations. There was a tendency here, to neglect some basic functional

aspects of the MESS structure, as well as to unknowingly introduce computational instabilities.

The need for a more comprehensive analysis of the MESS was really felt after the introduction of high-speed digital computing techniques. Here, the initial approach adopted was to calculate the behaviour solely by econometric methods that depend upon statistical data. Regrettably this procedure also has some serious limitations and the forecasts were not found to be very satisfactory, as noted by R.S. Pindyck and D.L. Rubinfeld [21]. Little account was taken of the actual physics of MESS operation, or in their idealization.

These various methods of modelling are unsatisfactory from the view-point of good functional simulation. They were caused by the practice of the model builders preferring to examine specific parts of the MESS in depth, rather than of initially contemplating the system as a whole, which is what is done below.

To properly determine the performance of the system, all of its functional properties should be included. Consequently the alternate path that is chosen here is crucial, namely that of Systems Analysis. The emphasis that the engineers give to the means by which a system works, explains why this approach is adopted. It finds application for the study of the performance of the whole system, when we provide for entities having different functional properties (the specific workings of which are briefly indicated). The expression of these economic functions by means of technical equations (see Chapters 11 and 12 on decision-making) can lead to a better kind of idealization, requiring a less superficial approach than that used by the sociologists.

3.3 Idealization of Entity Roles with Aggregation

It seems best to limit the degree of sector selection to the minimum needed to represent each of the separate kinds of functions that different parts of the system perform. However, it is unreasonable for each sector to function only in its unique way and some amount of duplication between sectors most probably is necessary.

Aggregate economic model performance must avoid the penalties due to the improvisations that were described above as behavioural. Here the method is to identify each element by its characteristic idealized functions and to collect these into an associated set of role-playing entities. The need for this

idealization is not unique to modelling the MESS, it is common to many engineering realizations. Indeed the only way that we can retain a concept of the real world is by imagining it in an ideal form, our means of perception being so fashioned as to be receptive to this style of imagery. Consequently, this particular aspect of the science is actually only a matter of degree and not the replacement by a basically new method.

Initially, the degree of idealization of the aspects of the emerging discipline was rudimentary. But with the development of the subject, passing from the most general image to more specific ones, a larger amount of idealization can be included--improving the quality of the original concept when it is reconstructed. There results a greater appreciation of the structure of the MESS and its functions. Consequently the sectors used in these analyses are called entities and they are heavily idealized.

As an example of this technique, by this ideal approach an aggregate government cannot buy land - to do so would require a change in its role. Similarly the aggregate landlord functions are unique. Landlords who transfer ownership within this macro-economic entity, do not directly affect any other kind of operation. But as soon as one of them sells all of the owned land, he/she no longer falls within this class. Consequently the total "amount" of land-ownership remains unchanged, regardless of this activity. However, land surrounding an expanding town may be taken up for residence and commerce instead of remaining in agriculture. Then, although the area of the land has not altered, it can be said that the degree of land-lording has increased due to the growth in the land-value. (The ground-rent may later be collected, it being partly the result of a specific land deal.) Thus the general landlord function has unique aspects that can be readily described here. Due to this kind of effect, the two concepts of idealization and aggregation are mutual and very amicable, when applied to the specific macroeconomics concepts envisaged here.

In the analysis, regular names are used for various aspects of the macro-economy, their idealization being in functional terms only, within the bounds of previous knowledge and experience. In particular this requires a flexible attitude to be taken to the entities, whose properties are abstracted out of their expected physical locations and their previously accepted social orders. In the past, econometric and other analysts have not tried to separate these two aspects of society (an approach that is in keeping with the less exact nature of the humanities). Even with the scientific attitude taken here, the extent of the idealization is limited to the minimum necessary (and sufficient) for the functional theory being introduced, with the least loss of character from each of the participants.

3.4 Additional Assumptions

3.4.1 Ease of Manipulation

For ease of manipulating the variables and for purposes of expressing the ideas contained here, a closed national economy will be assumed. This does not mean that the import and export of goods and the international transfer of money cannot be incorporated in the model. It is simply a convenient first assumption to reduce further complications.

3.4.2 Occam's Razor (see A. Baker [23])

In the logical development of our macroeconomics theory, it is a general principle to take the shortest possible route for analysis, without neglecting any significant aspects or functions of the system. Actually this rule applies to all scientific theories and it is known as "Occam's Razor", see footnote in Chapter 2.3.

3.4.3 Avoidance of Cross-Coupling

Within the macro-economy, the introduction of cross-couplings is avoided. These consist of certain indirect relationships inside the process of production, exchange, consumption and the investment in capital. An example of these effects is the elimination of pollution from industrial plant and the need for added investment in restoring ourselves and our world to its former condition, see K. Chen [30]. The effects of this policy are simplified in the model, by taking them within the production costs, which reduces the overall productive efficiency. Similar assumptions apply to other entities. This eliminates some unnecessary and unwieldy modelling detail.

3.4.4 Proximity to Equilibrium

In order to examine the fundamental aspects of the structure and the basic relationships between the outstanding operators in the system, it is convenient to consider the quantities as if they are close to their equilibrium conditions. Over the short time intervals being taken here, it is supposed that the monetary values of the exchanged quantities will soon arrive at a completely balanced state. For this purpose, any dynamic effects that carry over from earlier intervals have had their values re-set and then currently are held fixed. The growth of the macro-economy during this time period is therefore limited to the finding of its equilibrium state.

3.4.5 Terminology

The use of a specific terminology for the returns on various kinds of loans and investments is required. This is briefly listed below:

Yield - The return that accrues from the use of durable capital goods in production, after the coverage of depreciation and maintenance costs and any other expenses that directly result from this process. The depreciation in value occurs even when the durable capital goods are idle. Most of the capitalists (investors) who own the durable goods, accept both the risk and the gain possible, when the durables are employed in this way, with the understanding that these investors will receive all of the resulting yield. This covers the cost of renewal or up-dating, property taxes and the dividends paid to the share-holders. Some capitalists lend their durable goods for use in return for fixed-rate hire-fees. Then the aggregate yield includes these hire-fees.

Hire-fee - The return sums that are remitted to the capitalist for the use of the borrowed durable capital goods in both a productive (industrial plant, goods-carriers etc.) and in a "non-productive" role (such as private vehicles), over a specific period of time. Hire-fees cover the depreciation costs of these durables and include possible property-value taxation.

The hire-purchase of mortgaged property and other goods directly returns interest. It does not fall into the above category because the property is simultaneously changing hands. Both yield and hire-fees do not include any ground-rent that obtains from rights for access to the sites, which are not regarded as items of durable capital, see the end of Appendix G.

Ground-Rent - The return that is conveyed to the landlord for the right of access to the leased area of land or site, over a specified time interval.

Input and Output Flows - The input money-flow corresponds to the value of the output of goods and output money-flow to incoming goods. Wherever these two terms are used they need qualification as to what they refer.

Profit - A confusing term often used (but mostly avoided here), to include productive yield minus some of the additional (undefined) production expenses. However, the significant (psychological) aim of "making a profit" motivates all businesses.

The annual rates of return of interest are also specified as:

Prime-Rate - The cost to the Government (and tax payer) for National Bonds ("guilt-edged" loans), that comprise the multi-year accumulated National Debt. This rate is for the banks to take up and is set at the average over a long period.

Interest Rate - The cost of borrowing money, that has been saved in banks and

Dividend Rate - The current average "earning" rate paid on the shares of the public companies, for the money used by their directors for purposes of investment.

When considering dividends, any depreciation of the durable capital goods together with maintenance costs, property taxes etc., are first subtracted from the yield. What remains is then divided by the current value of the investment. This resulting rate of return is the dividend rate, as paid to the share-holders. This average rate may be greater or smaller than the current rate of interest offered by the banks, with the result that the price of the shares in a free-market stock-exchange will then self-adjust, see Chapter 15.1.

Normally these three rates are based on a time period of one year. However in Chapter 8.2 different duration "time-slices" are taken. Subsequently the numerical values of all these rates should be multiplied by the ratio of the length of the time-slice to that of a year.

3.5 Ethical Considerations

The first investigators in the field of Political Science included a significant amount of idealism, ethics and philosophy in their theories. These classic combinations of logic and emotion hopefully anticipated the social benefits likely, after the macro-economic theory had been developed along semi-scientific lines, which were intended to provide greater knowledge and deeper understanding. However without some kind of ethics being included within their analysis, the work of these pioneers would have seemed worthless, because they wanted to define and shape a better world. Even today, there is a strong tendency by writers on macroeconomics, to dispense some emotional or political views along with the theory. Many including the author, on occasion, still presume that the effort spent on the analysis somehow justifies the right to proclaim some kind of ethical message.

Rationalizing About How Our Social System Works

These early commentators of Political Science also needed to assume certain intuitive ethical principles, in order to make up for the lack of technical details, as well as to guide the process of their understanding. Consequently, as macroeconomics developed along more scientific lines, it was inevitable that less support was needed from certain of the ethical principles. What initially was regarded as being of the utmost importance as an ideal inspirational formulation for the future, was subsequently unquestionably assumed without comment, or it was dropped. For example, it is taken for granted that one aim of future macro-economies is for them to run on cleaner, less corrupt and more efficient lines than at present. Hence, in the few places where ethical considerations are still relevant, they need to be specified more exactly than in the past. In this macro-economic formulation, these places will be pointed out and their importance and value to the system will be explained.

Within the assumptions that are current for the development of theoretical macroeconomics, there is a need to include or at least to imply the most natural, optimistic and basic human behavioural tendency--to make the best of what is available, by using the least amount of effort. This is related to the optimization of production that results from the specialization of labour, and from the global effects on society of the law of supply and demand. However, there also exists the opposite trend for pessimistic isolation, prohibition, enclosure and monopolistic control, which all try to eliminate the threat of competition and to conserve what has previously been achieved. Both kinds of behaviour are part of our social system, to omit either from our general considerations would be unrealistic. Both involve business ethics, but with the intention here to avoid politics; no favouritism of either being acceptable.

The development of a universal macro-economic theory should not take sides nor be biased in any way. For purposes of understanding how the system works, it should be of no concern whether any particular ethical standard dominates. In the manner by which the rules for good government are followed, it should not be politically influenced nor favour any sector of the community, so too should our search for the understanding of functional macroeconomics be unaffected by the needs of any fraction of the society. Indeed if the system being represented is purely mechanical or physical in nature, there appears to be no need for any ethics to be added during its subsequent development. This leaves only the most basic of assumptions (of the kind with which the previous paragraph begins) being open for ethical consideration. Consequently, the former intuitive approach for including the ethics, no longer needs to play such a significant part. It is left to the reader to judge how badly or well this criterion has been met on these pages.

In parallel to this, the underlying insight of the French biologist Jacques Monod in 1970 [31] suggested that life is essentially physical and mathematical, without ethics being involved. This was a result of the previous discoveries about the giant double-helix molecules, in the form of DNA, that comprise our genes. The description and discussion of this idea, offered by P. Watson in "A Terrible Beauty" [32], provides much food for thought, some of which was previously presented at the end of R. Penrose's grand tour of physics, in his book "The Emperor's New Mind" [33].

PART 2. THE MODEL
Page

CHAPTER 4. THE CONCEPTION OF THE MESS MODEL

Having dealt at some length with the initial considerations and assumptions, we now advance to the practical business of model construction. To begin this from scratch it is necessary to channel our thoughts along the lines that a newcomer to this subject might be expected to argue, bearing in mind that he is able to continue from the preparations given above, by the adoption of a logical procedure.

4.1 The Variables and Entities

On first attempting to understand the complete system, a would-be macroeconomics examiner or assessor is likely to be confused by the amount of detail that he feels obliged to absorb. The system appears to be much too complicated! Even if he limits the scope to aggregate quantities, the general picture is still obscure. Such sources as K. Patterson *et al* [29] and S.Y. Kwack [34], both in the journal "Economic Modelling" do not seem to help because no clear distinction is generally made between the variables causing an effect and the effect itself. Consequently the aspiring analyst would have difficulty in appreciating the workings of the system as a whole. The choice of suitable variables must therefore be made with the aim (and on the basis) of producing a general simplification, to resolve the structure of the MESS out of the apparently necessary but bewildering detail, that is present in almost all recent writings on the subject.

Since the purpose here is to deduce how the system works, it is at least possible to recognize that there are two aspects of this general concept which need to be considered. These are: a) the agencies that cause a quantity to vary and b) the change itself.* The assumption of aggregate properties helps to simplify both these expressions. It is reasonable to list all the variables (that have been affected) and to collect them into groups that originate from the particular kinds of operations by specific agencies. Since there is a need to avoid the duplication of the activities, in the interests of simplicity each agency or operator should be taken as having unique properties in providing changes to its variables. By this approach, the various parts of the system that actually serve specific functions for the progress of the national economy

---

* It is noted that a third aspect c) the feed-back effect of the change on the same or on other "causing" entities, is not yet taken into consideration, but it will become significant at a later stage.

can be identified. This greatly helps to reduce the amount of complication. Thus the motley spectacle of the fully detailed MESS can be rendered intelligible using this style of perception filter - it being possible to envisage and discuss their unique functions and apply them directly to the analysis.

The agencies are known here as the entities of the system. They are selected to accomplish at least one major macro-economic function. These roles should of course correspond to the chief characteristics of the part of the MESS which are of interest. The identification of these entity functions comes from a study of a number of earlier writings that describe macroeconomics in less precise terms. After considering all of the factors and their effects, with the above premise of a difference between the cause, the affected variable and its immediate response (the results of which are temporally put aside), it is possible to begin to analyze the system in an optimum manner. And by careful use and reference to these considerations one can express the functional system in the simplest possible but most precise terms.

4.2 Choice of the Entities Themselves

We are now in a position to consider all the necessary and sufficient realized entities for the description of the operation of a closed (or non-exporting/importing) functional MESS model. After applying the procedure described above it is found that actually only six idealized entities are needed, namely:

Natural Resources	are held by the	LAND-LORD	entity L,
National Policy	is controlled by the	GOVERNMENT	entity G,
Domestic Life	centres around the	HOUSE-HOLDER	entity H,
Farming and Industry	are managed by the	PRODUCER	entity P,
Capital Investments	are owned by the	CAPITALIST	entity C and
Banking Accounts	are counted by the	FINANCE-INSTITUTION	entity F.

The six idealized entities (written using capital letters), are summarized in Table 1, in terms of the various major roles that each plays, their related parts of the MESS and certain measures of their economic performance (not all the actions being shown).

CONSEQUENTIAL MACROECONOMICS

TABLE 1. LIST OF THE SIX ENTITIES (FOR A CLOSED MACRO-ECONOMY)		
ENTITY NAME	MAJOR FUNCTIONS	ECONOMIC MEASURES
LAND-LORD (L)	# RESTRICTS THE RIGHT OF ACCESS TO THE LAND AND NATURAL RESOURCES. # LEASES-OUT SOME OF THIS OPPORTUNITY. # GATHERS THE RESULTING GROUND-RENTS. # TRANSFERS CASH TO CAPITALIST.	RENTAL VALUE OF THE LAND AND THE DEGREE OF ITS UTILIZATION.
GOVERN-MENT (G)	# COLLECTS DUTIES AND TAXES (COERCIVELY WITHIN THE LAW). # PURCHASES AND CONTROLS THE DISTRIBUTION OF SOCIAL AND EMERGENCY SERVICES (AND GIVES SUBSIDIES TO "THE POOR") # BALANCES THE NATIONAL BUDGET BY THE PURCHASE OR SALE OF BONDS, TO ADJUST THE AMOUNT OF MONEY CIRCULATING AND/OR PRINTS SOME MORE.	ANNUAL BUDGET, LIVING STANDARDS: INFLATION, PUBLIC HEALTH, PERSONAL SAFETY, UNEMPLOYMENT, CRIME-RATE, LIFE-SPAN AND RELATED STATISTICS.
HOUSE-HOLDER (H)	# EARNS WAGES FROM THE SUPPLY OF LABOUR. # PAYS INCOME/PURCHASE TAX. # BORROWS OR SAVES MONEY. # PURCHASES, ENJOYS AND DEPLETES CONSUMER-GOODS AND SERVICES. # CONVEYS GROUND-RENT ON RESIDENTIAL LAND. # HIRES HOME AND OTHER KINDS OF "NON- PRODUCTIVE" KINDS OF DURABLES AND # REMITS THEIR HIRE-FEES.	TOTAL POPULATION AND ITS GROWTH, WORKING-HOURS MADE AVAILABLE AND MONEY EXPENDITURE "PER-CAPITA".

ENTITY NAME	MAJOR FUNCTIONS	ECONOMIC MEASURES
TABLE 1. Continued		
LIST OF THE SIX ENTITIES (FOR A CLOSED MACRO-ECONOMY)		
PRODUCER (P)	# <u>MANAGES</u> THE PROCESS OF PRODUCTION AND DISTRIBUTION OF GOODS/SERVICES INCLUDING ALL MANUFACTURED AND AGRICULTURAL PRODUCTS. # <u>SELLS</u> PRODUCE. # <u>RETURNS</u> GROUND-RENT, WAGES AND THE YIELD FOR THE USE OF THE 3 FACTORS OF PRODUCTION (LAND, LABOUR & "CAPITAL").	GROSS DOMESTIC PRODUCT (GDP), RATIOS OF CONSUMER/ DURABLE GOODS AND OF PRICES/ WAGES AND DAMAGE TO THE ENVIRONMENT.
CAPITALIST (C)	# <u>ALLOCATES</u> "SHARES" IN RETURN FOR CREDIT. # <u>BUYS OR OUTLAYS MONEY</u> FOR DURABLES (OR CAPITAL-GOODS). # <u>HIRES-OUT</u> DURABLE CAPITAL GOODS INCLUDING HOMES. # <u>ACCEPTS</u> YIELDS AND HIRING-FEES ON INVESTED CAPITAL, AND INTEREST ON MORTGAGED HOMES, WHICH ARE PARTLY # <u>RETURNED</u> TO THE FINANCE INSTITUTION FOR THE USE OF ITS CREDIT.	VALUE OF CAPITAL AND SHARES IN BOTH PUBLIC AND PRIVATE COMPANIES. THE GENERAL YIELD RATE ON CAPITAL OUTLAY AND ON SIMILAR PROPERTIES WITH RESPECT TO MORTGAGES
FINANCE INSTITU- TION (F)	# <u>BORROWS AND LENDS MONEY</u> ACCORDING TO A REGULATED SYSTEM OF ACCOUNTS. # <u>DEALS</u> IN GOVERNMENT BONDS, CAPITALISTS' SHARES AND MORTGAGES, AND HOUSE-HOLDERS' SAVINGS, INCLUDING THE INTEREST WHICH IS # <u>RECEIVED</u> IN RETURN FOR THESE LOANS.	CREDITS, DEBITS & MONEY TRANSFERS. THE NATIONAL BANK'S "PRIME-RATE" r (OF INTEREST) ON "GUILT-EDGED" BONDS.

Due to the use of aggregate properties of the separately functioning entities, the nature of each has been uniquely idealized for use in this system. This is the difference between the functional presentation given here and the traditional expression of macroeconomics as a descriptive science with

theoretical supplements. The degree of the idealization used here separates it from the more human qualities of the people whose real-lives actually combine and enact many of these roles, see below. Thus it is **the action and not the society** that is portrayed.

For example, land is only bought and sold within the idealized LAND-LORD entity (the CAPITALIST entity role-player cannot buy it) and the ground-rent is returned to the former entity alone. Another case is that whilst an actual Government may assume full responsibility for the production of nuclear fuel (for reasons of safety). The GOVERNMENT entity is considered here to function only as law maker and enforcer, a tax collector, a distributor of social benefits, an adjuster of the level of demand and as a regulator of the National Debt. The nuclear fuel manufacturing capability of the actual Government is entrusted to the PRODUCER entity, which has its own functions and attributes that are not shared with the GOVERNMENT. Similarly, a HOUSE-HOLDER entity does not own durable goods (this activity being solely a CAPITALIST function). However, the HOUSE-HOLDER can hire these "non-productive" durable capital goods including residences in a similar way to the hiring by the PRODUCER of the "productive" durables. Only the HOUSE-HOLDER has a money-saving capability, entrusting it to the FINANCE INSTITUTION entity and then receiving the interest.

To be more explicit in specifying the roles of the entities, all their functions and ancillary features are included in the sets of formal definitions, provided in Appendix B. Some of the entities have more than one major function. However for purposes of this analysis, the arrangement under one name is preferable to splitting these entities into a greater number of closely connected sectors that are even more detached from this simplified presentation and from real life.

4.3 Relation Between the Idealized Entities and the MESS

Having taken pains to explain the difference between this idealized and simplified model and the actual population of society, it would then appear strange to disclose the existence of a practical relationship between the two kinds of situations. However a connection does exist and in fact it enables one to see that the complex real-life macro-economy may actually and reasonably be based on this much simpler set of basic operations. Every active real-life element in society may be regarded as carrying with it certain proportions of these six idealized entity's properties (or more, if trading between countries is being included as a separate function). To convert back

from these six idealized entities into the complex society as envisaged in past descriptions and analyses, the various fractions can be combined into each real-life element. For example every real House-Holder may also partly function as a LAND-LORD, PRODUCER, CAPITALIST, FINANCE-INSTITUTION and even as a GOVERNMENT entity, after allowing for a degree of philanthropic activity.

The conversion may be readily performed by preparing a suitable "recipe", using matrix mathematics to factor and collect the terms. This idea is further explained in Chapter 7 and the topic properly described in Appendix C. There is no theoretical limit to the complexity of this application nor to the size of the real macro-economic society that may be represented by this means. However as previously noted, when the model is enlarged by this means, the functioning of the 6 basic entities becomes hidden by the additional detail. Hence in order to maintain our aim of providing for good comprehension of the process, the direction taken by this kind of development is seen to be disadvantageous.

It is however, the implication of the representation of our society by the idealized system that is of greatest significance. The aggregate properties taken from all of the community contain fractions of the actual participation by a real member. All of his/her macro-economic activities (functions) thus fall within the six idealized entities listed here. Consequently, this representation properly covers the behaviour of the whole system, which is now envisaged to perform in a logical and tidy manner. Therefore it provides us with a precise (numerical) science of macroeconomics, which enables us to understand in depth the operation of the entire system.

CHAPTER 5. GRAPHICAL REPRESENTATION OF THE MESS

5.1 On the Use of Diagrams

It is a curious fact of nature that whenever we begin a train of thought, we are bound to model the subject in our mind's eye. Usually for simple matters, this technique is successful and with the need for sharing our ideas (due to our social drives), the ensuing vocal communications are satisfactory. But with original conceptions and more complex subjects, the model that each person builds tends to become different, indistinct and to mutate over time, so that the associated dialogue eventually breaks down. These limitations can be overcome however, when the parties agree to supplement their words with a conventional type of diagram or to adopt other kinds of graphic illustration. Thus, by the introduction of visual perception, the two conceptual models become identical. In addition, the use of this faculty frees the minds of the participants, enabling them to concentrate on other aspects of the subject that are of mutual concern. It is particularly between technical people, that this essential approach eases the way for the exchange of more elaborate ideas and for their development.

For the MESS situation, within a systems-engineering context, block and flow diagrams are particularly suitable for describing the relationship between the various entities (or functional parts) of the general system. As noted earlier, there is an additional advantage in the adoption of this technique. The diagrams provide a permanent record of the outcome of prior discussion on the theory and the structure. They also facilitate the subsequent development of the analysis and in particular will enable the Identity Equations to be formulated (see below).

There are many ways of drawing these diagrams, depending upon the motivation of the person who is describing the system. Being interested in the structure and functioning of the MESS, we should first examine this block and flow diagrammatic way that the entities can usefully be portrayed.

5.2 Visualization of the Entities in the MESS Model

In his book "World Dynamics", Jay W. Forrester [16] has suggested that suitable entities for his model of a world dynamic system are:

Population, Accumulated Capital and Degree of Pollution, etc.

All of these kinds of quantities he calls "levels" and each is provided with independent "supply sources" offering particular rates of "flow" such as birth-rate, death-rate, investment-rate, production-rate, etc. In this system, suitable entities for the blocks are taken as the basic elements that can accumulate with time. It should be noted that in the above reference, of necessity is added a large number of control paths, that are used to regulate the flows and so determine the levels. Some of these control signals depend upon the levels themselves and they can give rise to "feed-back" loops within the system.

Also for use in macro-economic models, the block and flow diagrams provide a suitable method of describing the situation. This visualization technique is directly related to Forrester's modelling method. In the diagram used here it is an advantage to directly connect the entity blocks. This permits specific flows (that are the variables) to pass between corresponding pairs. Each entity is thus envisaged as having a number of attributes or typical characteristics, which are recognizable from the associated input and output flows. The sizes of the flows themselves are regulated by relationships within and between the corresponding entities.

5.3 The Block and Flow Diagram

Using the six entities as the blocks (or closed boxes), it is now possible to construct the general diagram for the MESS (see Figure 1). The lines connecting the blocks represent the flows of the various economic quantities between the entities. These flows include consumer goods and services (including labour), the access (or lease) to land, the use (or hire) of durable capital investments (property), valuable legal documents (or rites) and of course money, which is the opposite flowing quantity for each of the other dealings in goods, services or paper-exchanges. The specific flows into and out of each entity are associated with the particular functions of each and in particular these include the three factors of production land, labour and capital and their corresponding returns ground-rent, wages and yield (or dividends and interest) as describer by Adam Smith in his classic book, known as "The Wealth of Nations" [3]. Some of these were briefly mentioned in Chapter 4 and all are listed in detail for each entity in Appendix B. These effects become clear after careful examination of the details in the block and flow diagram. The symbolic (algebraic) notation that is used with this representation is also given in Appendix B, and is included for ease of reference in Table 3 of Chapter 6.

CONSEQUENTIAL MACROECONOMICS

In Figure 1 the three money-flows of the FINANCE INSTITUTION are shown without the simultaneous return of: bonds **M** , savings **S** or investments and mortgages **I** . These loans are mostly redeemable and the interest is paid as additional credit. Thus, for these three kinds of variables the net flow of money actually can be in either direction. (For convenience only one positive direction is shown above.) The returns of interest on bonds is **rΣ(M)** , on savings is **rsΣ(S)** and on the dividend on investments is **riΣ(I)** , each of which is based on the accumulated sum within the particular entity. Algebraic symbols (letters) that are printed next to each other are multiplied together. However, where the rate of return is indicated by **r** the time-averaged Prime-Rate, then factors **s** or **i** indicate when it applies to savings and investments respectively.

When this kind of diagram is taken by engineers to explain the various situations and problems in dynamic systems (of electrical, hydraulic, chemical and mechanical applications), it is simply called a flow diagram. Then it finds use in many specific physical configurations. However, for our purposes this type of diagram represents the significant basic structure of the active MESS. Two notable multi-sector examples in works on macroeconomics may be seen in C.G. Uhr's "Economics in Brief" [35] and in J.K. Eastman's "Graphical Economics" [36]. However, in a more recent article by W.W. Leontief [37], his approach is really an elaboration of the popular and over-simplified house-hold/firm two-sector relationship, which was originally described by F.H. Knight [38] in 1933. This kind of diagram still appears in the illustrations of many more-recent text-books on macroeconomics and is commonly used by the Keynesians, such as in W.H. Branston's and J.M. Litvack's "Macro-economics" [39] and in J.B. Taylor's "Principles of Macroeconomics" [40].

FIGURE 1. FLOW DIAGRAM OF AN IDEAL FUNCTIONING MACRO-ECONOMICS SOCIAL SYSTEM (MESS)

FLOW NOTATION IS INDICATED BY LETTER-FACE
italic - *writ of ownership*
underlined - goods or services
bold - **money (with symbol)**

social and urban services

personal (income) tax - welfare - pensions Th

land title + improvements to the surroundings

land tax (revenue)Tl

LAND-LORD **L**

Cg appropriations

GOVERNMENT **G Σ(M)**

Bonds

supply of public services

security

access to land

industrial/rural service

Tc property tax

banker's credits– prime- rate of return M–rΣ(M)

Rh ground rents Rp

Tp purchase tax & V.A.T. – subsidies

Investment – dividends + mortgages – interest I – riΣ(I)

capital goods

wages Wp

HOUSE-HOLDER **H**

PRODUCER **P**

CAPITALIST **C Σ(I)**

FINANCE-INSTITUTION **F Σ(S)**

Labour

Hp yield

capital Cc outlay

shares & contracts

consumer goods

purchases Ch

durable goods

certificates

residences and

Hire- fees Hh non-productive durables

savings - loans - interest S – rsΣ(S)

"understanding"

organized money transfer Hl (from L)

CHAPTER 6. DESCRIPTION OF THE MODEL--THE MONEY-FLOWS AND THE ENTITIES

6.1 General Characteristics of the Money-Flows

In the flow diagram of Figure 1, there are 16 reciprocal or mutual money-flows. Each of these sends money on one heading in exchange for the goods and services, access rights to land and for the use of durable capital goods, as well as valuable legal documents or for an understanding, all passing on reciprocal courses. Three of these flows include an opposing component, described below - a total of 19 double-flows overall. The numbers of input and output flows are summarized in Table 2.

TABLE 2. THE NUMBES OF MONEY-FLOWS						
ENTITY	L	G	H	P	C	F	TOTAL
INPUTS	2	5	2	3	4	3	19
OUTPUTS	2	2	5	4	3	3	19
TOTALS	4	7	7	7	7	6	

The three negative flows in Figure 1 are the returned interest on savings and bonds as well as the dividends on investments. They pass either to or from the FINANCE INSTITUTION entity. There are other negative flows being returned, that consist of subsidies from the GOVERNMENT entity after the taxes are paid. For example, income-tax minus welfare is paid by the HOUSE-HOLDER to the GOVERNMENT, which is treated here as one flow, without the subsidy part being separated. A list all 19 flows is shown in Table 3 (on following page) - details about them are presented in Appendix B.

6.1.1. The Contractual Money-Flows

From Figure 1 and Table 3, it is seen that 14 of these mutual or double flows are the result of eleven kinds of contractual arrangements between the various pairs of entities. In the competitive setting of a free-market economy, the prices are determined by the supply becoming equal to the demand, an equilibrating process and condition described in Chapters 8, 13 and 16. These 14 flows fall into the following four categories:

4 direct payments in exchange for goods or labour, **Cc , Cg , Ch** and **Wp**
4 returns for use of durable capital goods or land,   **Hh , Hp , Rh** and **Rp**
3 outgoing loans or investments,   **I , M** and **S** with:
3 returning "interests" on their accumulated sums, $ri\sum(I)$ **,** $r\sum(M)$ and $rs\sum(S)$

TABLE 3. SUMMARY OF THE 19 MONEY-FLOWS SHOWN IN FIGURE 1.				
DESCRIPTION OF MONEY-FLOW AND ITS ALGEBRAIC SYMBOL		FROM/TO ENTITY		RECIPROCAL FLOW OF WEALTH OR UTILITY
Tax on Personal Income	**Th***	H	G	Social and Urban Services
Tax on Land-Value (Revenue)	**Tl***	L	G	Improvements to Surroundings
Tax on Purchases (V.A.T.)	**Tp***	P	G	Industrial/Rural Service
Tax on Property (not land but Durable Goods)	**Tc***	C	G	National and Social Security
Ground-Rent (on Residential Land)	**Rh**ϕ	H	L	Access to Land for Living on
Ground-Rent (on Productive Land)	**Rp**ϕ	P	L	Access to Land for Working on
Yield, within the Productive Process	**Hp**ϕ	P	C	Use of Durable Capital Goods
Hire-Fees (Domestic)	**Hh**ϕ	H	C	Use of Residences and "Non-Productive" Durable Goods
Organized Money-Transfer	**Hl***	L	C	"Understanding" Between **C** & **L**
Wages (Gross Earnings)	**Wp**	P	H	For Labour (Service)
Purchases (Consumption)	**Ch**	H	P	For Consumer Goods/Services
Capital Outlay, True Investments	**Cc**	C	P	For Durable Capital Goods
National Appropriations	**Cg**	G	P	For Supply of Public Services
Bank Loans for Re-Circulation	**M**	F	G	National Bonds (Credits)
Interest in National Bonds	**rΣ(M)**	G	F	For the Use of Total CreditΣ(**M**)
"Investments" (and Mortgages)	**I**	F	C	Shares and Contracts (Credits)
Dividend/Interest on "Investments"	**riΣ(I)**	C	F	For the Use of Total Credit Σ(**I**)
Savings (and Outgoing Loans)	**S**	H	F	Bank Certificates (Credits)
Interest on Savings	**rsΣ(S)**	F	H	For the Use of Total Credit Σ(**S**)

   *   Non-contractual money-flow. For the 4 taxes there are smaller amounts of subsidies flowing in return (see section 6.1.2 below).

   ϕ In the form of a Return on "Investment", see Chapter 3.4.5

rxΣ(...) 3 Returns on Total Credits, **r** carries a factor **x** , see Chapter 5.3.

The second kind of return covers the payments for the use of durable capital goods or for the access to land. The third kind is for the investments and savings lent and the fourth is the "negative-flows" of the returned interest and dividends that are paid on the accumulated credit. These eleven return-rate oriented payments are listed in Table 4 below, their names coming from the definitions given in Chapter 3.4.5.

TABLE 4. THE RETURN-RATE PAYMENTS ON THE 11 CONTRACTUAL AGREEMENTS			
RECIPIENT	INCOME/ PAYMENT	SYMBOL	CONTRACTUAL RATE ON QUANTITY
LAND-LORD	2 Rents.	**Rh Rp**	% of Value of Land.
HOUSE- HOLDER	Wages. Interest.*	**Wp** **Rs∑(S)**	Per Man-Hour. % of Savings minus Loans.
PRODUCER	3 Sales.	**Cc Cg Ch**	On Prices of Product.
CAPITALIST	Yield. Hire-fee. φ	**Hp** **Hh**	% of Value of Durable Capital Goods. % of Value of Domestic "Non- Productive" Durable Capital Goods.
FINANCE INSTITUTION	Interest and Dividends.* Prime-Rate.*	**ri∑(I)** **r∑(M)**	% of Mortgages and of Investments. % of National Bonds.

* These payments are the returning cash-flows of the past accumulated contractual loans ∑(S), ∑(I), or ∑(M) respectively flowing in the reciprocal direction.

φ For most industrial organizations, this flow is of a social obligatory kind, but a few along with the HOUSE-HOLDERS, remit fixed hire-fees.

Three of the returning money-flow components depend on the accumulated sums that have been loaned and the corresponding rates of interest (on the savings certificates, shares or bonds). These return-rates are not necessarily equal, but the differences in their values are usually small, unless the balance between the demand and supply of money (involving the FINANCE INSTITUTION) has been significantly and deliberately biased, as in times of financial crisis. Thus the three rates of investment "earnings" should present the would-be saver/speculator with a decision having to be based on other more practical considerations. This similarity is because in a free-market the entrepreneurs can readily deal in what they see as the most advantageous kind of investments. Incidentally, this includes land-values treated as if it is a durable capital good (even though this is not the true situation).

6.1.2 Non-Contractual Money-Flows (Asterisked Flows in Table 3)

The five remaining flows are not the result of free contractual agreements. These money-flows are of particular interest since they represent obligatory sociological pressures that exist and act within the community. These five direct money-flows are: **Tc** , **Th** , **Tl** , **Tp** and **HI** . As noted after Table 4, some of flow **Hp** also falls within this category. The first four money-flows are taxes taken by the GOVERNMENT. They are included in the lists of

Appendix B, whilst **HI** is an "understanding" as explained below in connection with the LAND-LORD entity.

6.2 Description of Four of the Entities

The GOVERNMENT, LAND-LORD, CAPITALIST and PRODUCER entities only are selected here. They have been chosen because they are the least familiar ones and some of their properties are not well known. The first three of them have not been properly explained before and they are fully covered below, whilst the last one gets a less lengthy treatment. The other two entities, the HOUSE-HOLDER and the FINANCE INSTITUTION, are better understood in general. Their properties are more fully examined in Chapters 7, 9, 12, 14 and 15.

6.2.1 Properties of Flows and Actions of the GOVERNMENT Entity

Of the five obligatory money-flows, four pass to the GOVERNMENT entity in the form of taxes. To some degree the subsidies reduce the size of these flows, but their effects are not separated here. These 4 taxes are raised by coercion, the moral justification of which is borne by the legislative body of this entity. It duly prescribes this money-burden according to a pre-set political philosophy (which in a democratic regime is theoretically the result of the elector's choice). These taxes and subsidies depend not only on the legislation but also on the amount of activity by each agent.

In return for the taxes, various social services are handed out by the GOVERNMENT entity. These services enhance the functional capacity of the other entities, at the expense of the taxpayer. Of particular importance amongst these services is the amount regularly invested in the community surroundings. Enormous sums are put into the construction and maintenance of roads, sewers, educational institutions, public services, transport systems (both inter-city and local rail, including some underground), air and sea-ports with their costly navigation and docking facilities. These developments have a large and beneficial influence on the productivity and value of the surrounding public and private land. For example, at airports the availability of suitable parking "slots" used by large civil aircraft (even for an hour during re-fuelling and turn-around) is a major issue during negotiations with airline operators. The demand for these favours is competitive. Legislation is not well equipped to deal with this distribution of opportunity and the fierce activity to win them derives from the selfishness of the various parties involved.

CONSEQUENTIAL MACROECONOMICS

The influence of municipal projects on land prices is so great that it causes the speculative purchase of the surrounding sites, where even a remote possibility for future local developments exists, as explained by Fred Harrison in "The Power in the Land" [41]. Landowners who monopolistically withhold the more productive land from normal use (and incidentally cause both it's price and ground-rent to be raised even more), severely limit the advantage created by the investment of public money. The adverse effect of this land speculation on the national economy can be more damaging to a country's progress than the direct taxation of personal income, due to the resulting higher production costs and the subsequent reduced demand for goods bringing with them increased unemployment and greater poverty.

The GOVERNMENT entity also controls the amount of money in circulation by dealing in bonds that cover the National Debt. By choosing to redeem some bonds, it allows more money to become available which stimulates the economy by encouraging greater demand. The same result is obtained by reducing the legal reserve-ratio on savings-deposits that banks must retain when they extend credit. The opposite actions apply when a diminished demand is required during a surge of business activity. A third and less direct method of control of the degree of macroeconomic activity is when the National Bank adjusts the Prime-Rate of interest on its bonds, causing a modified re-investment behaviour, see Chapter 14. In practice the GOVERNMENT is somewhat limited in this action due to the competition from industrial and commercial shares on the stock-exchange. Usually the Prime-Rate is changed with the purpose of creating longer-term effects rather than by introducing the other two kinds of adjustment, which will normally cause faster responses when they are (usually) contrived to work in the same direction.

There are also dynamic changes caused by the GOVERNMENT entity, when the above actions occur. These effects are not considered here in this simple model for equilibrium. However the creation of effective money, by permitting an increase in the sale of goods on credit (for a limited duration), also should be included. The use of credit and debit-cards normally allows for up to a month's advance on earnings and they are also related to the total amount in the bank deposits.

6.2.2 Properties of Flows and Actions of the LAND-LORD Entity

In this analysis, for convenience all natural resources are termed "land". The value of this natural resource, as a site on urban or rural land, is largely due to its location and the "improvements" that have been made to the

surrounding populated region. This site-value arises from the social preference for people to live together in a community, as well as the prior use of public money, see Appendix G. Ideally the income that results from this public investment should be used to relieve the burden of other forms of taxation. However in practice, this is far from what actually occurs.

In making his choice for investment, a new landowner assumes the role of a LAND-LORD, having a unique (idealized) function. The ground-rent that the land generates, as explained by D. Ricardo [4], does not vary in the same way as the yield from investment in durable capital goods (after the deduction of depreciation and taxes). Should there occur an overall reduction in the dividend rate on investment, (due to an exogenous cause) the ground-rent is not directly affected. Then the land has the power (as described by F. Harrison [41]), to generate a greater sum compared to what is obtainable from an equal investment in durable capital goods. Consequently the price of the land will rise compared to the average share-price, due to the change in the "capitalized" value of its usefulness. Specifically, this is the ground-rent divided by the average dividend rate on capital investment, which determines the effective land-value.

An increase in the rate of yield on investment has the opposite effect on the value of the land. Share prices will then grow, but the land will become less valuable, due to its more stable ground-rent. In practice there is a tendency for the LAND-LORD entity not to reduce the resulting ground-rent in parallel with the decreased rate of income that otherwise is obtainable from the same investment in recently raised share prices. The implication is that what generates the ground-rent for the LAND-LORD, (namely the usefulness of the land coupled with its demand) is different from the advantage (dividend) that the CAPITALIST otherwise obtains by his ownership from investment in the shares of durable capital goods. The ground-rent associated with land ownership is actually its earning power, due to the greater productivity that the specific site provides, compared with that from a remote but similar enterprise which is only just worthwhile to keep running. This is in accordance with Ricardo's Rule of Marginal Ground-Rent [4], when extended to include urban communities.

Landowners tend to monopolize and restrict trading in land, that otherwise would permit its full utilization. Those who both own and occupy it are unconcerned about the ground-rent that it generates (and which consequently would be paid to themselves). Some of them do not collect any rent at all, nor are they even aware of its existence, due to the absence of buildings etc. As a result of the acceptance of this adverse convention in our social behaviour, much valuable land is held out of proper use and the parts that are

competitively utilized enable the landlords to extract an exaggerated amount of ground-rent, known as "rack-rent". Alternatively they may speculate on an anticipated increase in the land-value that arises from the GOVERNMENTAL planning effects previously noted. A more complete treatment of this and related subjects about the theory of land-values, is provided in Appendix G.

Due to these particular characteristics of the land, it is necessary to separately incorporate the LAND-LORD entity into our economic model – as first envisaged by Henry George [8] more than 130 years ago, but largely ignored in modern works on macroeconomics. The idealized LAND-LORD may pay some of the ground-rent to the GOVERNMENT entity as a tax on land-values **TI**, however the remaining and usually greater amount **HI**, is passed to a privileged sector within the CAPITALIST entity. This fifth non-contractual money-flow deserves more explanation.

At first sight this money transfer might appear to actually be the return on the cost of the land, being the same as the hire-fee or dividend as derived from all other kinds of investment in durable goods. However, the land itself cannot seriously be regarded as such an investment item, because its value was not directly created by a production process. (If it was, then land ownership by a CAPITALIST entity would not cause hardship to others when it is not properly used, the right of which is taken for granted by the owners of other kinds of property--land being created not made.)

This resulting money-flow **HI** is due to the "understanding" that exists between the LAND-LORD and CAPITALIST entities, who in reality might be the same person or family (that is connected in the same way as the tie of the worker with his consumer family household). Passage of this money to the CAPITALIST entity is one of the socially obligatory money-flows, mentioned in section 6.1. This relationship is confused due to the CAPITALIST'S mortgaging of real-estate, which includes land value. In fact this credit (negative understanding) is shared with the LAND-LORD. Part of the understanding is non-obligatory, when the land is un-worked whilst speculation in its value occurs. Instead of passing on the ground-rent, the land lies unused until the LAND-LORD sells it. He collects and transfers the gain in its value, due to the improvements made to other sites and public utilities in the region.

The transferred sum is then used by the CAPITALIST entity, either for the purchase of durable capital goods; or at least it enables this entity to reduce the amount of credit on new investments, that were previously obtained for the enterprise, by the issue of share certificates. However, only some of the

actual capitalists will benefit, our aggregate theory does not separate this sector within this idealized entity.

6.2.3 The CAPITALIST as a Functional Entity

So far there has been no proper description of the specific part played by the CAPITALIST entity. This term has been used in the past to describe a powerful group within the society--whose role, however, is indistinct. The capitalist is usually portrayed as the economic opposite of the working class. His power is thought to be used to ruthlessly manipulate the forces of production and high finance. He is obviously a monopolist and the claim of "exploitation of the workers" is also laid at the capitalist's door. But exactly what he is and how he does it remains unexplained. The writer finds that a better definition is necessary and the functional analytic approach taken here enables it to be found. The role of the CAPITALIST is seen from examination of the flows into and out of this specific entity (in Figure 1, Table 3 and Appendix B).

In this analysis there is clearly a place for a functioning entity that lies between the PRODUCER and the FINANCE INSTITUTION. Its operations are distinct from these other two, but this action should not be confused by the emotional approach taken above. "Capital" has two meanings here, being either the durable goods (such as buildings, tools or machinery, for use in the production process) or the partly worked materials already in the process, as used by the PRODUCER entity to complete the product. The first meaning of capital is also for the money that must be laid out for purchasing the durable goods as investments for subsequent hire and use. Both the purchase and hiring-out of durables are executed by the CAPITALIST entity as envisaged here. This entity obtains money by offering shares in Public Companies. The sums, having thus been procured from the FINANCE INSTITUTION (which includes the stock-exchange), are immediately expended in purchasing the necessary durable capital goods and facilities. (In this idealized model the outlay does not include land purchase, although as already suggested a real-life capitalist may combine land ownership with the factors described above and incorrectly claim that the resulting ground-rent is solely a product of his investment.)

The direct costs of production, see below, are deducted by the PRODUCER entity, and any value-added and pollution taxes are similarly paid. Then the remaining yields and hiring fees, for the use of the durable goods, flow to the CAPITALIST entity. Much of this yield is regarded as dividend, which is returned to the share-holders as if it were interest on loans. This yield is taken as a contractual money-flow, because the CAPITALIST entity usually lends

goods according to pre-set conditions. However in many actual cases, where there is a more intimate relationship between the PRODUCER and the CAPITALIST entity, the sum remaining with the PRODUCER entity is transferred without pre-conditions. In the real-life situation the role of the CAPITALIST is often combined with the PRODUCER and LAND-LORD entities, by the managing-directors of many small manufacturing and service-supplying companies. These individuals act as owner/operator. Some of them even have sufficient capital and cash to act independently, without having to depend on credit from the FINANCE INSTITUTION.

The hire-fees for houses are also part of the CAPITALIST entity's income. Without including the residential land, he regards the investment in homes as no different from any other kind. In our model, the income from the land (on which the house stands) is also ground-rent which is actually taken by the LAND-LORD entity, as described above.

6.2.4 The PRODUCER'S Participation

The producer occupies a portion of our bio-sphere and brings to it labour and durable capital goods. Within the "space-time continuum" provided by the land, useful produce then can result from the execution of work. This action is in three stages. Firstly, some of the land's natural resources, namely the various minerals, vegetation or life-forms are nurtured, grown and/or gathered. Both features of the land, namely its physical resources and the space-time that it occupies, are necessary for this part of the process. In the second stage, this bounty is treated to extract or refine the useful material content. Thirdly the partly worked resulting substances are then fabricated into goods having exchange-value and they are brought to a trading centre. This productive process is aided by the use of tools, equipment, buildings, vehicles etc.--prior forms of durable wealth that are provided for assisting in the making and marketing the particular kind of product.

The wealth and value of the produce is the result of four kinds of combined actions. It is partly from the access rights to the land and the material extracted from it. This value is partly stored in the labour exerted during production. The remaining value of the product comes from the utility supplied by the durable capital goods, which includes covering small losses in their capacity for use, due to the need for periodic maintenance or renewal, after having become worn, rusty, ineffective or obsolete.

The respective returns for these four types of expenditures are ground-rents, maintenance/depreciation costs, wages and yields (the latter sometimes

being replaced by hire-fees). The first two returns are for the potential or opportunity-use that these factors offer, advantage of which may not necessarily be taken, see Chapter 13.1. The other two return costs are for the expenditure of human energy, both directly and for that previously invested in the durable capital goods. The PRODUCER pays the ground-rents, wages and maintenance costs of the durables including their replacement when necessary. The yield on the durables is finally paid to the CAPITALIST.

To conclude this section, it can be seen that by defining the entities very specifically in terms of their functional roles (see also Appendix B), there emerges a somewhat different, grimmer but more precise and clearer picture of the function of the particular parts of the MESS within the community and nation.

6.3 Internal Structure and Organization of the Entities.

Five aspects of the internal structure of the entities are of interest. The full description and modelling of two of these aspects lie outside the scope of this work. The other aspects contain features that are needed for subsequent use. All five are listed in the following categories of the internal properties of the entities.

6.3.1 Accumulations Within Entities

Accumulations of land-value, durable capital goods, valuable legal documents and sums of money and credits (debts) can occur within the entities, the ability to store being a significant aspect of their internal organization. Only two of the entities retain money, which is best used quickly. These kinds of accumulations are shown in Table 5, on next page. (Note: the lower rows for certain entities are written using italics and shading. These relate to where the accumulations involve valuable legal documents. The resulting contractual compensatory money-flow returns are also shown.)

In common with some of the activities listed in Appendix B, not all of these accumulations are of the functional nature for use in this simple model. The accumulators by themselves are not regarded as variables for determining the equilibrium, where the product of the interest rate and the accumulated quantity are used (see the three kinds of interest in the right-hand column).

ENTITY	ACCUMULATED QUANTITY (Underlined) OR OBLIGATION *italics*	PROVIDED BY THE ENTITY AS	ACTIONS, RETURNS TO OR PAYMENTS FROM THE SAME ENTITY
LAND-LORD (L)	Land-Values provided by the access rights to sites for use in production by P and for residence by H, or may be left vacant, see Appendix G.	From rest of community, without it even being aware of its loss.	Speculates in land-values due to growth of community. Receives Ground-Rents **Rp** and **Rh** from P and H.
	Credits on redeemable loans $\sum$**(Lp+Lh)**, which are for land ownership contracts.	C money (and later from F).	Transfers some income due to its "understanding" and interest as **Hl = ri$\sum$(Lp+Lh)**
	Land Title Deeds.	G *documents*	May pay Land-Value Tax **Tl**
GOVERN-MENT (G)	Emergency Reserves of food/medicines/munitions/housing/vehicles etc.	P by purchase (using Taxes).	Maintains and replaces when obsolete or used, consumed.
	Credit on National Debt $\sum$**(M)** as redeemable bonds.	F **money**.	Returns Interest **r$\sum$(M)** (Prime-Rate).
	Law and Justice System.	*Self-generated.*	Maintains Public Order and Keeps the Peace
HOUSE-HOLDER (H)	Residences/Durables.	C utility.	Remits Hire-Fee **Hh**.
	Land in Home-Use.	L access.	Conveys Ground-Rent **Rh**.
	Work-Force (some unused)	Self-generated.	Labour, gives service in return for **Wp**.
	Unspent **Money** (pending).	P or G **money**.	Reserve sums for use.
	Saving Certificates $\sum$**(S)**.	F *documents.*	Receives Interest **rs$\sum$(S)**.
PRODUCER (P)	Durable Capital Goods including work in progress.	C utility.	Supplies maintenance. Remits Yield/Hire-Fee **Hp**.
	Land in Productive use.	L access.	Conveys Ground-Rent **Rp**.
	Waste Produce	Self-generated.	Pollution, spoils nature
CAPITALIST (C)	Credit on Shares and on redeemable Mortgages $\sum$**(I)**.	F **money**.	Returns Dividends and Interest **ri$\sum$(I)**.
	Contracts on Durable Capital (both productive and domestic) **Kp**, **Kh**.	H utility and P utility.	Receives Hire-Fees **Hh** and Yields **Hp** (some of the latter being obligatory).
FINANCE INSTITU-TION (F)	Credit on redeemable Savings $\sum$**(S)** (including Money Reserves in vaults).	H **money**.	Returns Interest **rs$\sum$(S)**. (By sensible custom or by law).
	Government Bonds $\sum$**(M)**.	G *documents.*	Receives Interest **r$\sum$(M)**.
	Share Certificates and *Mortgage Contracts* $\sum$**(I)**.	C *documents.*	Receives Dividends and Interest **ri$\sum$(I)**.

TABLE 5. ACCUMULATIONS WITHIN THE ENTITIES SHOWING COMPENSATORY PAYMENTS (see also Figure 3 and Chapter 7.5)

Except for the money held by the HOUSE-HOLDER and FINANCE INSTITUTION, the numerical worth of the accumulated wealth or valuables is the result of previous specific flows, when the input has exceeded (or effectively exceeded) the output. An example is durable capital goods, efficient production could not take place without them. This table appears to be complex because of the provision of documents in return for access, utility, loan or pledge. These documents stipulate that the contracting entity will provide a monetary return as compensation, and this paper represents the investment. The associated money-flows are shown separately.

The accumulations of material wealth deteriorate with time and they need regular maintenance and gradual replacement. The size of the stored quantity can also be used for automatic "feed-back" control. If the quantity greatly exceeds normal proportions or badly runs down, a crisis is eminent necessitating an avoiding action.

6.3.2 Decision-Making Actions of the Entities.

When the contractual money-flows leave an entity, they can take more than one path. The freedom of choice that this gives to certain entities may be seen from an examination of Figure 1. It allows for a limited amount of decision-making in their **demands** for goods, labour, land access, utility and pledges on investments. The total sum used in making these demands does not change. However the proportions of it that are distributed between the various paths depend on the organization within the particular entity, where it is autonomously adjusted to operate in the best manner.

Similarly, certain contractual flows entering an entity are also the results of choices made by a different set of entities (of Figure 1). Some of these entities have freedom for deciding on the proportions of supplied goods, land access, utility and pledges on investments that they exchange for money. The total value of these **supplies** does not change. However, these proportions too depend on the organization within the specific entity, which has the same broad aims as mentioned above. These matters are discussed in greater detail in Chapters 9 and 10. The combined effects, spread over a short period of time, tend to equilibrate the MESS.

6.3.3 Sectors

These are divisions inside entities, which are not normally included in this analysis. The sectors within the PRODUCER entity have been the subject of many intensive studies, both by L. Walras [10] and the Input/Output analyses by W.W. Leontief [37]. This entity is actually so complicated that it is tempting

to divide it, at least into the various basic sectors of heavy industry, manufacturing, agriculture, utilities and diverse services. But even when only this is done, it adds nothing more to our understanding of how this entity fits into the macro-economy at large, nor does it add any explanation about how it functions there. Each of the PRODUCER sectors works by combining land, labour and durable capital goods (and returning ground-rent, wages and yields, as well as covering the tax and maintenance costs) over a period of time, see A. Smith [3], H. George [8] and others.

6.3.4 "Privilege-Groups"

This is the name for those sectors that are connected to particular parts of the entities by specific flows. In the example mentioned above, the connection between the LAND-LORD is to a specific part of the CAPITALIST entity. However not all of this entity has an income that originates from ground-rent. In this situation and for the GOVERNMENT entity's subsidies too, there exist privilege-groups receiving the benefit, with connections that exclude the remainder of the four taxed entities. These groups are not specifically involved in this analysis.

6.3.5 Multiple-Functions and Split-Functions

The structure of the model has been deliberately chosen to resemble the organization of our society. However, only a certain amount of similarity is possible due to the overlapping actions occurring in practice, as previously described in Chapter 4.3. The particular structure used in the model in Figure 1 allows for certain entities to function in multiple ways, but it also divides other entities that otherwise might be shown as doing this.

In this model, the multi-functions are performed by the HOUSE-HOLDER whose internal structure could be split into the Worker and Consumer sub-entities. However, since the connection between these sub-entities is simple and sure, a finer division is of little value in understanding the basic MESS structure. On the other hand, the more commonly accepted concept of Capitalism includes land-ownership, but here these activities are deliberately made separate. This is because the basic nature and actions of the LAND-LORD and the CAPITALIST entities are different, although they are related. (Had they been the same, the money transfer **HI** and its associated "understanding" would not be needed and no explanation would have been made to sanction its flow.)

In the work presented here, the degree of idealization is deliberately limited, in order to isolate the various functions of the entities, whilst at the same time trying not to loose too much of their individual character.

CONSEQUENTIAL MACROECONOMICS

PART 3. ANALYSIS

CHAPTER 7. ANALYSIS OF THE MONEY-FLOWS--THE IDENTITY EQUATIONS AND SOME EFFECTS OF THEIR TOPOLOGY

7.1 The Flow of Money Within the System

In the block and flow diagram of Figure 1, money flows into and out of each entity. This medium of exchange, nominally bank-notes (but also in the form of checks, electronic credit accounts and Treasury Bills) has no intrinsic value, see Chapter 13. However, it does serve as a convenient and fair means of regulating the distribution, costing and pricing of the goods, services or documents that pass in the reciprocal directions. Although certain entities can hoard the access rights to areas of useful land, quantities of partly-worked materials, consumer and durable goods and valuable legal documents (share certificates), there is no equivalent concentration of money within the system. Compared to these accumulations, the average steady value of the working cash and credits, which are held by the consumers and banks, is relatively small. This is because the money is of greater use when it is either:

a) spent purchasing goods and services (for consumption or investment) or
b) credited to another agent or entity who agrees to return the interest.

Even when the GOVERNMENT entity decides to sell additional bonds (which effectively increases the National Debt), the sums that it receives are immediately spent. Similarly, some of the reserves that are retained by the banks against deposit accounts are actually short-term investments in the form of "liquid assets", rather than being held as true currency. (These are of 7 days and 24 hours calling times, at progressively lower annual rates of interest with the shortened notice of withdrawal.)

Financial credit is included in the model by the use of valuable legal documents. These documents also enable the accumulations of goods and loans to be accountable, without the need to balance them in the same way as the money-flows. For example, the CAPITALIST entity covers the FINANCE INSTITUTION entity's investments, by the acceptance of mortgage-contracts and the issuing of share certificates, in return for these outlays in purchasing the durable goods (as capital).

The effect of competition and the need for the two contractual parties to agree on an exchange price, always ensures that the sale is of benefit to both sides. When it is found to be unacceptable between one pair, a similar bargain will

be struck elsewhere with a different party, possibly at a different price where the criterion of supply and demand being equal (and opposite), can now be satisfied.

As can already be appreciated, these various money-flows are subject to certain rules and in this chapter some of them will be examined.

7.2. The Input/Output Approach and the Flow-Matrix

With the exceptions of the HOUSE-HOLDER and FINANCE INSTITUTION (see Table 5) no entity can accumulate significant quantities of money on average over a moderate time period. Then the total amount flowing in must equal the total sum flowing out according to supply equalling demand (A. Marshal [9]). The calculation of this aspect of the system is known as Input/Output Analysis. It has been studied extensively by Nobel Prize Laureate Wassily Leontief [12] and by C-S Yan [28], when applied to highly sectored versions of the PRODUCER entity (in order to present data on the division of wealth within the industrial community).

Using Assumption 3.4.4 to avoid dynamic effects, this approach may be applied to the whole macro-economic system too. Then each entity can be balanced by equating its input and output money-flows in a separate expression. There being six entities in the MESS model, the premise of there being no change in any money accumulation consequently provides for a total of six relationships between the 19 money-flows. These six expressions are also known as the Identity Equations. As mentioned in Chapter 3.1, they are simultaneous and linear with unit coefficients.

Before working out the Identity Equations for all of the entities, it is convenient and advantageous to express Figure 1 in a more concise form. Suppose that we write all of the inputs to an entity term-by-term along one row of the square matrix shown in Figure 2 and all of its outputs in the same order in a column. Then it will be found (since the output from one entity is always the input to another), that the 19 flows can be compressed into the matrix having six rows and six columns, one for each entity. There are three return-flows on investments (interest) going in the opposite directions to the original investments themselves. Their positions in the matrix have been arranged so that they all appear as positive quantities.

FIGURE 2. THE INPUT-OUTPUT FLOW MATRIX

OUTPUT FLOWS (COLUMNS)

		L	G	H	P	C	F
	L	--		**Rh**	**Rp**		
INPUT FLOWS (ROWS)	G	**TI**	--	**Th**	**Tp**	**Tc**	**M**
	H			--	**Wp**		**rs∑(S)**
	P		**Cg**	**Ch**	--	**Cc**	
	C	**HI**		**Hh**	**Hp**	--	**I**
	F		**r∑(M)**	**S**		**ri∑(I)**	--

As noted above, this approach was first applied to the many sectors of industry by Wassiley Leontief [37] for finding the spread of these activities. His method was later modified to include the effects of certain other kinds of agents within the system, although his matrix never incorporated these kinds of idealized functional entities for a full MESS, nor was it ever expressed in this form. The algebraic symbols that appear correspond to those given in Figure 1 and Table 3 (of Chapter 6).

The logic of the algebraic notation should now become clear. With the exception of the 6 flows associated with the FINANCE INSTITUTION entity, the first (block- capital) letter of a flow refers to the row on which it is placed and the second (lower-case) letter refers to its column. It should be noted that each row of the matrix has its own individual algebraic term for the value, expressed as a money-flow, as may be seen by comparing them in Table 4 .

From a mathematical viewpoint it is possible to reduce the size of the matrix by eliminating one row and the corresponding column. In other studies of the macro-economy the LAND-LORD entity is frequently combined with the CAPITALIST entity (and sometimes with the PRODUCER entity too) without it causing any difficulty to the algebra--although these forms are incorrect from a viewpoint of the idealized functional macro-economic concept of reality given here. However, due to the fact that the FINANCE INSTITUTION entity deals with the rate of interest, both in the input and output sides, its existence is of great importance. To omit it would be to eliminate one of the most basic characteristics of the system. This also applies to the HOUSEHOLDER and the PRODUCER entities.

CONSEQUENTIAL MACROECONOMICS

The "leading-diagonal" of the matrix, namely the places where inputs and outputs correspond for the same entity, is deliberately left blank, because in macro-economics there is no external flow here. Had the entities been sectored as in C-S Yan's introduction [28], areas such as the PRODUCER entity square would be expanded and partly filled* but there would still be an empty leading-diagonal for the same reason as given above--no single entity (or firm) can act as a catalyst for its own supplier/demander. Other empty squares in the diagram indicate an absence of a specific activity or connection between the entities involved, a topological feature of later use.

---

* This approach enables our 6 x 6 matrix to be enlarged so as to include the effect of various kinds of industry, for which see in the general expansion method described in Appendix C.

7.3. The Identity Equations

When using this concise method of presenting the money-flows, the total flows entering and leaving each entity still are equal. Then for each entity in turn, this balance is also obtained from equating the sums of the corresponding row and column, in Figure 2. The following six Identity Equations include these totals, which also are given by the algebraic notations to be described after defining the equations themselves.

ENTITY (…): INPUTS (ROWS) = SUM = OUTPUTS (COLUMNS)

LAND-LORD L: $$Rh + Rp = LRN = Tl + Hl \qquad (1)$$

GOVERNMENT G: $$Tl + Th + Tp + Tc + M = GNB = Cg + r\textstyle\sum(M) \qquad (2)$$

HOUSE-HOLDER H: $$Wp + rs\textstyle\sum(S) = Y = Rh + Th + Ch + Hh + S \qquad (3)$$

PRODUCER P: $$Cg + Ch + Cc = GDP = Rp + Tp + Wp + Hp \qquad (4)$$

CAPITALIST C: $$Hl + Hh + Hp + I = CPL = Tc + Cc + ri\textstyle\sum(I) \qquad (5)$$

FINANCE INSTITUTION F: $$S + r\textstyle\sum(M) + ri\textstyle\sum(I) = FIC = M + I + rs\textstyle\sum(S) \qquad (6).$$

The sums on both sides of these equations, taken in turn, are proportional to the effectiveness of the role played by each kind of entity and its relative importance within the system. When all the money-flows are for one year, the

total flow or measure of each entity, which is given an algebraic notation, can then be recognized (for the numbered equations) as follows:

LAND-LORD: (1) Annual Ground-Rental Conveyance   **LRN**
GOVERNMENT: (2) The National "Budget" Collection   **GNB**
HOUSE-HOLDER: (3) Workers' Annual Income Earnings   **Y**
PRODUCER: (4) Gross Domestic Product   **GDP**
CAPITALIST :   (5) "Profit and Loss Account" for the Year **CPL**
FINANCE INSTITUTION: (6) Annual Balance of Extendible Credit   **FIC**.

Attention is directed to the fact, as seen from the equations, that the Gross Domestic Product **GDP** of the PRODUCER entity and the Workers' Annual Income **Y** of the HOUSE-HOLDER entity are not the same, nor can they be easily related.

Except for the names of the sums, the number of terms in these equations corresponds to those in Table 2 including the 3 interest/dividend rates of return. 19 terms are involved each appearing once on each side, when the six equations are taken together. The use of all these quantities is slightly different to that in other descriptions. Here it is the net tax after the deduction of a subsidy that is used. In other places, the subsidy is usually placed on the other side of the equation, which then results in the appearance of a greater total sum of exchanged money.

The set of identity equations is applicable at equilibrium for any time-period, hence the differences in values after the inclusion of newly issued or withdrawn sums by the government etc., ``must also comply with these six expressions. By allowing the time intervals to become infinitesimal, the rates of change of the money-flows are obtained. When taken to the limit, the three returning interest money-flows $\mathbf{rx}\sum\mathbf{(...)}$ (the factor **x** indicating the kind of investment or loan), are replaced by the product of the factored rate of interest **rx** and the instantaneous loan or investment money-flows **M** , **I** or **S** . The other 16 terms become first-order differentials with respect to time. This differentiation procedure can be repeated for higher orders of the dynamic terms - each order also having to satisfy the resulting Identity Equations. Although the subject is not pursued here, by this approach it is seen that these equations can also further our knowledge about the money-flow dynamics (as in Chapter 12).

CONSEQUENTIAL MACROECONOMICS

7.4 The Effect of Symmetry About the Leading-Diagonal

At this stage it is considered useful to examine this interesting and important aspect of the topology of the money-flows and of the flow-matrix. Strictly, the leading-diagonal effect comprises part of the description of money-flows in Chapter 6. However, without having already constructed the flow-matrix, one would inevitably miss the full meaning of this expression. Consequently, this aspect is examined below, before taking the next important step dealing with equilibrium analysis, in Chapter 8.

Referring to Figure 2, for the cases where there is symmetry in the matrix, in the occupied squares across this leading diagonal, the six occurrences of these flows are:

Cg with **Tp**   (PRODUCER and GOVERNMENT entities),
Cc with **Hp**   (PRODUCER and CAPITALIST entities),
Wp with **Ch**   (PRODUCER and HOUSE-HOLDER entities),
M with **r∑(M)** (FINANCE INSTITUTION and GOVERNMENT entities),
I with **ri∑(I)** (FINANCE INSTITUTION and CAPITALIST entities) and
rs∑(S) with **S**   (FINANCE INSTITUTION and HOUSE-HOLDER entities).

From Figure 1 it is seen that these sets relate to situations where there are two money-flows between the various pairs of entities, with the flow in both directions. These provide 6 simple closed circuits within the system, in which the circulating part of the flow has a certain amount of independence from the rest of the MESS. Due to entrepreneurial forces, these flows are able to fluctuate freely. However the extent of this activity depends upon contributions from both entities. The proportion of the flow circulation, that each entity provides, may be compared to its total input or output.

TABLE 6 CIRCULAR MONEY-FLOWS DUE TO SYMMETRY ACROSS THE LEADING-DIAGONAL			
FLOWS BETWEEN ENTITIES	CIRCULAR MONEY-FLOWS	PROPORTION OF OUTPUTS	
		FIRST FLOW	SECOND FLOW
P - G	**Cg, Tp**	**Cg / GDP**	**Tp / GNB**
P - C	**Cc, Hp**	**Cc / GDP**	**Hp / CPL**
P - H	**Wp, Ch**	**Wp / GDP**	**Ch / Y**
F - G	**M, r∑(M)**	**M / FIC**	**r∑(M) / GNB**
F - C	**I, ri∑(I)**	**I / FIC**	**ri∑(I) / CPL**
F - H	**rs∑(S), S**	**Rs∑(S) / FIC**	**S / Y**

In describing the circular flows, the strength of these proportions as summarized in Table 6. The implication of the effects of these ratios is explained in section 7.4.5. All of these circuits are based on either the PRODUCER or the FINANCE INSTITUTION joining with one each of the GOVERNMENT, CAPITALIST OR HOUSE-HOLDER entities, but without involving the LANDLORD, whose activities are less direct. This gives us a sort of priority status on the degree of macroeconomic activity by the six entities.

7.4.1 Money-Flow Circuit: **Cg** with **Tp**

In this set of money-flows, there is a coercive tax **Tp** on production, which circulates with part of the GOVERNMENT entity's expenditure **Cg**. The retail sales tax is regarded as a necessary means used by this entity to help cover its budget and to control the MESS. **Tp** is usually set at a modest proportion of the price and placed on all but the most basic commodities. Overall, the effect of this circular flow is to re-distribute some of the produce on a macro-economic scale as the GOVERNMENT entity sees fit, for humane, philanthropic and nationalistic purposes (to forcefully preserve and protect -- aimed at preventing disasters and alleviating the results of catastrophes). However, this means that there will be an adjustment to the pattern of goods consumption, which distorts the free-market motivation to produce. Except in extreme circumstances such as war, famine or plague this policy is unsatisfactory, since the handing-out of GOVERNMENT entity-purchased goods is not necessarily based on the demand decisions, and it often "unknowingly" results in waste.

The proportion of the GOVERNMENT entity's output money-flow role here is not 100% (the difference, usually small, being due to the interest it returns on bonds). However, the "diagonal" sum paid out by the PRODUCER entity as tax, comprises only a small proportion of this entity's participation within the GDP.

7.4.2 Money-Flow Circuit: **Cc** with **Hp**

The investment flow into new durable goods **Cc** partly circulates with the returning yield money-flow **Hp**. The size of **Cc** may be greater or smaller than **Hp**. The latter flow is due to the working arrangement between the CAPITALIST and PRODUCER entities, much of which has no constraint nor agreed limit. (For this reason, the vague term "profit" sometimes adopted by economists, is an expression that seems able to launder this dubious money-flow into a state of respectability!) **Hp** is expressed here as the yield, after the maintenance costs (without depreciation) have been deducted.

The relationship between the PRODUCER and the CAPITALIST entities is often so close that for the major part of flow **Hp** is non-contractual. Then its size depends to a large degree on the strength of the monopolistic forces, which act to enlarge it. Otherwise when there is a contract between them, the resulting competitive forces oppose this trend, by the reduction of what in effect is the hire-fee for the use of the durable capital goods.

Usually there is a steady growth for which new durable capital goods are continuously needed. As the level of technology rises, the rate of productivity expands with the need to replace obsolete capital. **Cc** is the net amount of new investment in this capital, after deducting scrap values (with the aim of employing the other factors of production in a most effective manner). During the time periods used here this latter flow is volatile, because the amount of new investment depends on the interest rates and the anticipated level of trade.

The CAPITALIST entity uses a large proportion of its expenditure in this circuit for purchasing durable capital goods. Hence the participation from the PRODUCER entity in providing the hire-fees **Hp** can sometimes be a large part of the money flowing between these entities. But without this monopolistic effect, it is more modest due to the amounts needed as returns for use of the other two factors of production.

7.4.3 Money-Flow Circuit: **Wp** with **Ch**

Both of the flows are the result of contractual agreements. In the circulation between the PRODUCER and HOUSE-HOLDER entities, a human relationship between labour and the work-conditions plays a part. Payment of wages "in kind" modifies the relationships and eliminates some of the reciprocal money-flows. In particular the un-reckoned "non-productive" home-cooking, cleaning, clothes-washing and child-care that multitudes of house-wives dutifully perform, become formal labour when a chef, house-keeper, servant or nanny are employed at home, whilst the lady of the house works (or luxuriates) outside. Two or more jobs result from this changed status, which once took these kinds of home working activities almost for granted.

The general tendency of the HOUSE-HOLDER entity is to spend and consume rather than to save. (The need to satisfy a desire for the enjoyment of goods and services is a very human characteristic, which from a personal viewpoint is often limited only by the will and ability for making the effort to acquire them through wages.) Hence, a large part of personal income is used

as output to provide for the consumption and not much is saved. It would appear that the increased employment supplies more produce and provides more to spend, see J.M. Keynes [42]. But this is a fallacy because were the sums saved instead of being spent, there would be greater investment and the corresponding increase in production of durables surely would replace that of the consumables. As noted above, the PRODUCER entity is committed to various output payments, wages being only one of them. A considerable proportion of the sales income goes into ground-rent, maintenance of durable capital goods, hire-fees, taxation and dividends returned to share-holders, so the proportion of the sales price that is used for providing wages is moderate.

7.4.4 Money-Flow Circuits: **M** , **I** and **S** with **r$\sum$(M)** , **ri$\sum$(I)** and **rs$\sum$(S)**

The last three sets of contractual circular flows provide the returns, paid as interest or dividend for the use of credit. Sometimes instead of paying these returns, shares or other units of the fund are added to the previously registered quantity, or their values are raised when the interest is directly re-invested in them. The magnitude of these calculated money-flows depends directly on the rate of interest **rx** which is the "price" of the loan (the **x** being generalized for one of three factors, unity, **s** or **i**).

The growth of the total accumulated investments $\sum$**(M)** , $\sum$**(I)** and $\sum$**(S)** , is the result of the amounts **M** , **I** and **S** that were invested within all the past time-intervals. The current sizes of these three values are affected by the anticipated demand, which can rapidly change. It depends on the behaviour of the stock-market, which in essence responds according to the yield on capital investments **Hp** (although in practice the means by which this occurs is very sensitive to external trends, and even the aggregate values being considered here are affected). The income from the interest is fed-back, in either an optimistic mood of seeking enhanced investment opportunities (a bulls-market), or alternately when the interest is at a lower rate, it used to repay past debts in the depressed state of a depleted money-demand situation (a bears-market). The value of **r** may be found by making it the subject of Equation (6):

$$r = (M + I - S) / (\sum(M) + i\sum(I) - s\sum(S)) \qquad (7).$$

Here the two factors **i** and **s** have been separated from **r**. In the numerator, the difference between **I** and **S** is relatively small compared to the size of **M** . However, the values of **M** , **I** and **S** may be positive or negative making:

$$I = I+ - I-, \quad M = M+ - M- \quad and \ S = S+ - S-,$$

so this equation may be poorly formed for determining the value of **r** . Both **I** and **i∑(I)** are particularly volatile due to sensitivity in the stock-market, see Chapter 15.1.

Equation (7), shows the important "leverage" that the GOVERNMENT entity has when making transactions in the new bonds **M** , for use in the control of **r** , see Chapter 15.2. This influence on the rate of interest is achieved by regulating the sale of the bonds or by their redemption and withdrawal. It is un-reasonable to control the variation of both of these quantities simultaneously, due to their relationship within Equation (6). In places where it is possible to directly adjust the value of **r** for the interest paid on the new bonds, the resulting demand for them should be allowed to find its own level, or there is a risk that undesirable inflation/deflation effects will be introduced into the system.

For the entities laying on the sides of the circuits that provide the interest as output, there are large accumulations of capital in two cases and the proportion of their activity within the system is high. Both the GOVERNMENT and the CAPITALIST entities pass this money-flow output to the FINANCE INSTITUTION entity. The output interest that this entity pays for the use of savings, is a more modest proportion compared to its other two kinds of investments **I** and **M** , whose flows comprise the other side of these circuits. The third investment participant, the HOUSE-HOLDER entity can also play a significant part, since the amount of his savings **S** (either in or out-going) express his confidence in the current macro-economic climate.

7.4.5 Effect of the Proportions on the Circulations

The money-flows of significance here are symmetrical with respect to the leading-diagonal of the matrix, resulting in six closed circular flows between certain pairs of entities within the MESS structure. The effect of the participation of the wages and consumption goods circuit has already been mentioned above and this is now explained in greater detail.

Suppose that there is an increase in one of the output money-flows such as taxes, wages, hire-fees, purchases, investments or their returning interests. Due to the topology of the circuits, each output flow helps the entity on the opposite (input) side to cover its various demands. These may comprise of more consumer and durable capital goods and national requisitions from the PRODUCER entity, loan-capital for acquisition of more durables by the CAPITALIST entity, more credit to assist in investment from the FINANCE INSTITUTION and the redemption of savings for new shopping by the

HOUSE-HOLDER entities, etc. In turn, these generate more economic activity as wages, taxes, hire-fees etc. on the first side of the circuit. However, they are of smaller size compared to the change made by the first cycle. The result is an endless series of progressively diminishing extras, because each cycle in the circuit produces a smaller effect. (This is illustrated numerically below.)

The particular circuits within the system are able to anticipate these effects and to respond quickly. But it is only after these changes have fully diffused, that we are interested in their new values. Due to the feed-back ratio having numerical values smaller than one, the sizes of the increments soon reach a stage where they can no longer be discerned. The ratio between the final steady flow improvement and the initial difference is termed the "multiplier-effect" and each circuit has its own multiplier, whose size is inversely related to the number of entities involved. Then it is the pairs of diagonally symmetric flows (the 2-entity circuits of Appendix F) that provide the system with the most significant multipliers. The following example is presented to illustrate certain aspects of the multiplier-effect in our MESS.

Consider the third circuit in Table 6, above. Suppose that a new law is introduced which raises the minimum wage by 10% and that this law affects 25% of the labour force. Then the rise in average wages over the whole macro-economy is 2.5%. Although the HOUSE-HOLDER entity has another source of income (the interest on savings), this entity also bears other kinds of expenses that are outside the 2-entity circuit being considered here. Suppose that on average only half of the increase in earnings is spent here on consumer goods. Then the proportion in this part of the circuit is **Ch / Y =** 50% of the total flow. ***If this alteration acts alone***, the effect of this feed-back on the expenditure for consumption will be an increase of:

$$0.025 \times (1 + 0.5 + 0.5^2 + 0.5^3 + 0.5^4 + \ldots) = 0.025 \times 2.0 = 0.05 \text{ or } 5\%.$$

Therefore the proportion of total output money-flow of **Ch/Y** = 0.50, has resulted in a multiplier = 2.0 being applied to the consumption, which is the Keynesian Multiplier-Effect, as described by J.B. Taylor [40] and many others. However as shown, it was derived here using of only part of the circuit.

We now examine what happens when the other side of the circuit is included. The cost of production also rises, due to the greater average wage. It is supposed that the proportion of the total cost paid as wages is: **Wp/GDP** = 40%. This is because the PRODUCER entity also provides returning money-flows for the use of the other two factors of production, which are presumed not to have changed. Consequently when the

expenditure due to the increased wages is included in the value of the consumer goods, the overall proportion around the complete circuit is the result of multiplying together the two separate effects. Then this becomes: 0.5 x 0.4 = 0.2   instead and the increase in circulation is:

$$0.025 \times (1 + 0.2 + 0.2^2 + 0.2^3 + 0.2^4 \ldots.) = 0.025 \times 1.25 = 0.03125 \text{ or } 3.125\%.$$

Therefore the proportion of total output money-flow of:

$$\textbf{(Ch/Y)} \times \textbf{(Wp/GDP)} = 0.20,$$

results in an overall multiplier of only 1.25 being applied to the consumption.

The average consumption expenditure has grown by 3.125% whilst the average production costs have risen by 10% on a quarter of the 40% labour costs, or 0.10 x 0.25 x 0.40 = 0.01 or only 1.0%. This has an effect on the PRODUCER, who increases the prices of his goods by this proportion. Then the overall effect is to raise the average purchasing power of all of the labour force to:
$$1.03125 / 1.01 = 1.021\%,$$

 whilst the minimum wage workers actually will enjoy an effective increase of:

$$(1.10 / 1.01 - 1.0) \times 100\% = 8.911\% \text{ (instead of the 10\% as planned)}.$$

The effect of the return flow has considerably reduced the size of the multiplier (overall). Hence the second multiplier-effect, laying in series in the same circuit, *has an opposing effect compared to the first one*. The average increase in wages of 2.50% improves the average purchasing power by only 2.1% and not by the 5.0% that was first seen (when the initial or Keynesian Multiplier was calculated). A longer series of multipliers on some of the other circuits applicable to this initial change (see Appendix F for **Wp**) including some multipliers that are less than one, will result in even smaller overall effects.

This analysis illustrates how the multiplier-effect is altered by our including more of the MESS circuit, instead of the single part of the money-flow that is most commonly used in the Keynesian Theory of Money and Employment [42], see Chapter 15.3 and 16. These considerations provide us with a more comprehensive understanding of the situation within the complete system. It is found from Figure 1 that many more-complicated circuits are possible,

which involve all of the entities, the effects of each (as a "pivotal" variable) being determined in Appendix F.

When all of the possible circuits are considered for a specific kind of change (as used in the example), some of the flows become reduced in magnitude due to the choices taken for the more direct increased feed-backs. The multiplier-effects described above apply to these smaller flows too, which have multipliers that are less than 1.0. So the overall effect is to reduce the first multiplier even more. It is thought for the whole system that the overall multiplier equals unity, because money is neither created nor destroyed. Individual circuits that are pivotal for one basic variable have multipliers that either exceed or are less than one, depending on the circuit being considered. Thus the improvement to the state of the minimum wage earners will result in a loss somewhere else. This aspect is described in section 7.6.

In common with the Keynesian Multiplier analysis, see R. Hicks [14] and others, there is no consideration given here to the speed with which it acts or the time for it to be completed. The subject of time-dependency will receive treatment in the following chapter. (Over a longer time-period it is expected that the effects of the change in the minimum wages law will have broader repercussions and the revised money-flow decisions will influence the system in a more dynamic way.)

7.5 Accumulated Quantities and Their Returns

Before leaving the subject of the leading-diagonal, it also can be used to illustrate the relationship between the accumulated quantities of Table 5 to their returning money-flows. As is seen from Figure 3 (on next page), the accumulated quantities and their returns also occupy the symmetrical positions (dumb-bells) across the leading-diagonal (dashed). This should be compared to Figure 2 and the money-flow pairs in section 7.4, which have certain similarities and differences. Using some additional algebraic symbols: **Lh** , **Lp** , **Kh** and **Kp** as defined in Table 5, the seven accumulated physical quantities (three being documents) that are asterisked (*), and their positions in the system, are as indicated here.

FIGURE 3 MATRIX OF THE SEVEN ACCUMULATED QUANTITIES AND
THEIR RETURN MONEY-FLOWS ACROSS THE LEADING-
DIAGONAL

OUTPUT-FLOW QUANTIES (COLUMNS)
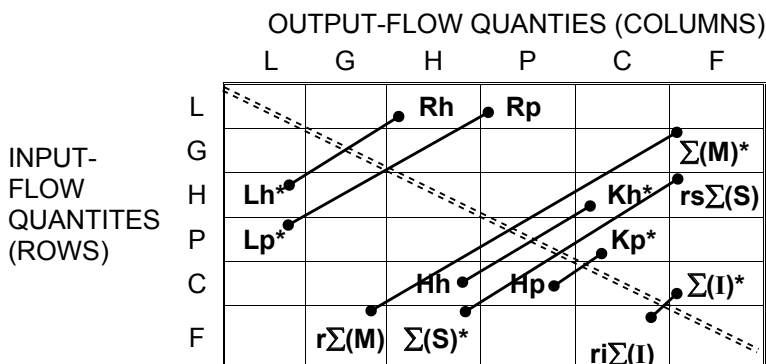
7.6 Effects and Implications of the Circulation of Money-Flows

There are actually a total of 46 money-flow circuits possible for the MESS
shown in Figure 1. The complete list of these circuits is provided in Appendix
F, based on each of the 19 money-flows. The number of entities **in series** in
each of these circuits varies between two and six. On reaching the second
entity in the circuit, the large Keynesian initial effect of the flow is reduced by
the subsequent arrivals and flow choices that complete the circuit. The
circuits having the largest numbers of entities are most influential on the
reduction of their multipliers, due to the greater number of choices (after
taking into account the effects of all their participation ratios). Hence, the
greater multiplier-effects are from the shorter circuits, including in particular
the two-entity ones listed in Table 6 and described in section 7.4 above.

For a money-flow between two entities having in common two or more circuits
in parallel, the combined multiplier-effect is the sum of the proportion of each
one separately (the inverted sum of the reciprocal values). Then for flows
having a number of many-entity parallel circuits, the overall multiplier-effect
also becomes smaller when the various effects are added. The concept of
money circulation is not like that commonly assumed in the two-sector model,
where like blood circulation all of the flow passes through one location (the
heart). In our model the total money-flow can only be found by summing all of
the output or all of the input flows:

$$SUM = LRN + GNB + Y + GDP + CPL + FIC \; ,$$

the components of which pass through each of the specific entities, see Equations (1) to (6).

In Appendix F it is shown that there are many cases of parallel money-flows circuits, having a pivotal (or common) flow between two specific entities. Indeed there is often a conflict between the directions of the flows in the various (other) parts of the circuits, which must be resolved before the complete set of multiplier-effects can be determined. The problem can only be resolved when the decision-making properties of the entities are used and specific flows choices are taken. This matter is dealt with in detail, somewhat differently than here, in Chapters 9 and 10 and in summary in Chapter 11.

The above two topological situations result in a set of varied multiplier-factors (some greater and some less than one) being spread over the money-flow matrix. The value of each effect depends on the location taken for making the initial incremental change. It also depends on the proportions of the flows entering and leaving each entity for different purposes (and according to differing criteria). When all of the real multiplier-effects have developed and are in place, the system is regarded as having reached a state of equilibrium; namely by the process supplying the self-adjustment, prior to arriving at this status. For more on the circulation of money see Chapter 13.

Then the Identity Equations are applicable, to the stability of our system. This subject is discussed more fittingly in the next chapter on general equilibrium. (However, it should not be avoided when examining the nature of the circular flows described here.) Due to the nature of the circulation within the system, this property both reduces and stabilizes the effects of sudden changes in the short run. But it also defers rather than completely absorbs their consequences, because the initial effects of the change concentrate on the more directly involved parts of the system, before it spreads to more remote regions.

CHAPTER 8. EQUILIBRIUM, TIME-DEPENDENCY AND
STABILITY OF THE MONEY-FLOWS

8.1 The Inter-Relations Between Entities and Their Equilibrium

Even a casual examination of the MESS structural model shows that all of the money-flows are inter-related and decisions made within one entity influence all of the others. For example using Figure 2, a change in the amount of income-tax **Th** (paid to the GOVERNMENT) by the HOUSE-HOLDER entity, affects the remaining amounts expended by it on goods consumed **Ch**, rents conveyed **Rh**, hire-fees remitted **Hh** and savings loaned **S**. This is because the sum of these five kinds of money-flows comprises the total output from this entity. With the provisional need to conserve this output, Equation (3) then must be numerically adjusted (to ensure that in the modified situation this sum still equals the total income). However, these supplied outputs in turn equal the demanded inputs of other entities and the sums of these flows also must equate to their total outputs. Therefore, any change to one flow, regardless of its origin, has disturbing effects around all of the various circuits and the effect of introducing a single incremental change initially throws the whole system out of kilter.

These transients rapidly spread over the entire MESS due to the circular nature of the money-flows. However, after each iteration this redistribution also has the effect of making the increments progressively smaller in size, without any oscillation in their values. In the previous chapter, the macro-economic model was shown to have finite sized multiplier-effects, due to the ability of the flow changes to circulate around the resulting feed-back loops. Then by deduction from these two facts, the system is naturally (or inherently) stable, because the disturbances must become smaller with each cycle. (The possible exceptions are at places where, for a limited duration, the sizes of the variables are constrained and their effects pile-up before over-flowing. These limitations are described in Chapter 16.) At the new condition of general equilibrium, eventually to be achieved, all of the flows will arrive at their revised steady-state values, even though a stability criterion may have been temporally violated during this process of self-adjustment.

In one sense, this approach avoids having to explain how the state of equilibrium was first obtained. As envisaged here, general equilibrium of the MESS is the result of a growth process where at each interval, small increments in the money-flows are combined from the previous stage of economic development. (For a fully-grown system that is shrinking in size, the

same principle applies except that the increments are of opposite sign.) From the history of these exogenous changes, the current situation is obtained after the increments were successively spread around the matrix. At some time, each of these finds and settles at the particular conditions necessary for its equilibrium. General equilibrium is thus seen to be the outcome of a process of integration with respect to time, of the various responses to past external changes.

Although the origin of the macro-economy now seems to us to have been so small that it could be obtained after a single step from zero, when viewed from that perspective the situation must have appeared to be similar to the present one. Then the establishment of equilibrium should not depend on one's point of view, nor should it be affected by the growth process itself. In macroeconomics, general equilibrium is normally the result of an existing self-stabilizing process. Consequently, it is preferable to examine the trend to reach equilibrium, namely the stability of the system instead simply of its existing semi-steady state. This tendency is easy to see because this process is inherently stable, the present condition of "almost-equilibrium" tends to be established from any past state. Actually there is no need for us to allow the system to reach perfect equilibrium--all that is required is a stable tendency toward it and a resulting state that, hopefully, is reasonably close to the ideal.

Within the MESS taken here, this simplified systems-engineering approach requires that instead of considering stability criteria (which can get to be very complicated), we assume that the money-flows are close to a perfect equilibrium state. This property of the system is considered in detail below.

Two aspects are significant here:

    a) overall external (general) equilibrium of the money-flows, between
       entities and
    b) local internal equilibrium of the money-flows, within each one.

Hence, we find that in addition to the formation of the Identity-Equations, the money-flow matrix-model of the MESS provides a means of envisaging the manner by which they vary. Later it will be seen that it also enables the process of decision-making to be expressed in a practical form.

Before this subject is examined in greater depth, it is convenient to separate the dynamic effects into two kinds of time-dependency and to discuss the implications in some detail.

8.2 The Partitioning of Time for Use with Systems-Dynamics

So far, the time element has only found use in an informal manner, to enable the circulating flows to adjust to their stable values. However, the dynamics of the system need more-serious consideration, because it is due to their presence that equilibrium is continuously being sought. It is important to distinguish between the large-scale global time-dependent kinds of change, associated with growth (or decline) of the system over many months and the other self-seeking macro-economic changes, expressed by means of the multiplying-factor effects described in Chapter 7. In the former long-term situation, when unsteady time-dependent terms are introduced, the system can oscillate or even start to diverge. (Such unstable behaviour involves another subject which is worthy of attention by the systems-engineers--the overall nature of the time-dependent system. As an example, deliberate inflation can cause monetary instability, after the Government encourages speculation in negotiable matters that labour does not directly create, particularly land-values.) However, these long-time changes do not comprise all of the dynamics and we will concentrate here on equilibrium over shorter time intervals when the disturbances are absorbed without oscillations. The significance of the small-scale type of stability has now been related to the influence of the multipliers.

In order to separate the two kinds of dynamic effects, the concept of taking "time-slices" is introduced here for convenience, where the global (or external) time-dependent dynamics are assumed to be interrupted (or temporally frozen) over these relatively short time intervals. All **exogenous changes,** including the use of the pre-set values to allow for the global time-dependent dynamics, are then consigned to occur **at the instants between the time-slices**. However in order to permit the system to self-stabilize its money-flows, as previously defined (and assumed in Chapter 3.4.4), the system is given freedom within the time-slice to self-adjust. It is considered to have reached a state of internal equilibrium once these "local variations" have dissipated. The relevant global dynamic aspects will be briefly discussed at the ends of the particular sections that follow.

The implication of this has an interesting feature. After first referring in Chapter 7 to the two classes of money-flows having either contractual or coercible properties, it can now be appreciated that the contractual ones are associated with the variable flows that occur continuously and endogenously within the time-slice. In contrast, the coercible ones are always due to sudden flow changes and these are best consigned as exogenous happenings at irregular intervals, which are placed at certain instants between the time-

slices. Thus, when we consider the long-term dynamics of change, they arise from the sudden introduction of new external conditions that initiate the development. Of course, it can be argued that even without the time-slices the same thing could be conceived as occurring along with the continuously-variable stability changes. Whilst this is true, the concept causes greater difficulty in picturing the workings of the system as a whole and it is best to regard these dynamic effects as being separate.

(The term "disequilibrium" is used in some texts, for example by W.H. Branston and J.M. Litvak in [39] and J.B. Taylor in [40], where the value of the exchanged goods and services do not balance. This enables time-dependent quantities to be included within the Identity-Equations, allowing for the global dynamic effects without the need for their temporally inhibition within the time-slices. In modelling the system, prior to simulation studies, unless the time-slices are of sufficiently long duration, lag effects will not be fully dissipated. Such lags are due to delays in salary, rent and tax payments, bank clearance of checks, short-term temporary loans, release of dividends, storage of goods, etc. However there is no need to consider disequilibrium in our MESS model, due to the simplifying assumptions made about its static equilibrium, which have just been described.)

With the introduction of time-slices, the various money-flows may be conceived as being specific to each period. Hence the money-flows are actually flow-rates and in general the simultaneous exchanges of goods, services and valuable documents for money is a continuous process that should be taken as passing simultaneously between the entities. This process contradicts Frederick Bastait's "Candle-Maker's Petition" [11], which is invalid. Here a privilege-group claims that their specific participation increases the amount of money available, when their particular kind of transaction takes place. However, this transfer of money does not allow the same sums to be used elsewhere, even with the concept of flow-rates applying, so the gain by the privileged few results in a non-privileged loss by the rest of the community. The total rate of all the money-flows is the speed of its circulation within the system (including other transactions, some of which are bartered or hidden). This echoes the somewhat impractical Quantity Theory of Money by Irving Fisher [43], where over a specific time, the product of the number of transactions of average size with its speed of circulation, then determine the total amount of money in use (see also Chapter 14). This approach also implies that the multiplier-effects act almost instantaneously, with the simultaneous working of their various iterations.

8.3 External and Internal Equilibrium of the Entities

The external equilibrium is based on the current conditions, on the relationships between the entities, involving variable prices and quantities of goods and money-flows. Regarding the contractual flows of ground-rents, wages, purchases, hire-fees, loans and the interest returned on them, they all depend on ***the demand meeting and equalling the supply*** of each flow. This broad concept is covered by the Identity-Equations, where the supply and demand sides of Equations (1) to (6), use the same algebraic symbol for a specific input or output money-flow between entities.

With the taxes and parts of the yield (that are coerced or sociologically obligatory), no sum is paid out that is not simultaneously collected and this is similar to what was described above. It comprises the necessary and sufficient considerations for the external equilibrium of the system. Unlike traditional micro-economic treatments, in our monetarist model there is no need to explain the micro-economic manner by which the price of goods and their quantity are related to the supply and demand functions. The criteria for the supply equalling the demand, is met in our model by the simple algebraic equivalence of using the same symbol once on each of the two sides of the six equations. Note that in the money-flow matrix this equality is implicit.

The Internal equilibrium is the result of the entities applying autonomous control over certain of their input and output flows. Due to their many actions being simultaneous* and in parallel, these entities thereby regulate the extent of their participation in the MESS operations. Then the resulting decisions enable the best deals to be struck, the optimal amounts of available resources to be employed and the ideal allocations of produce to be spread. These matters are regarded as part of the internal equilibrium of the entities. The balancing of the Identity-Equations also comprises part of this process, all of which is carried out by the decision-making role of the entities. Due to the magnitude of the task, the detailed description of the entity's decision-making is deferred to Chapter 9, 10, 11 and 12.

---

* This is actually an assumption, which implies (with good reason) that the decision-time is at least an order of magnitude smaller than the duration of the time-slice. Without this assumption it would be necessary to allow the response to a decision to be carried over to the following time-slice--with the unwelcome need to include these partial kinds of dynamics within it.

8.4 Equilibrium and Stability within the Time-Slice, and in General

Without long-term or global dynamic effects, the process of reaching equilibrium can be envisaged as occurring iteratively and independently within each time-slice; the money-flows reaching their steady values, normally before the next set of outside circumstances need to be considered. The achievement of this state has been described by Leon Walras [10] as a "tâtonnement" or groping process, by which the self-adjustment of the economic system proceeds. Accordingly, the MESS continuously searches for a new state of equilibrium, which is inevitable provided that the basic system is stable. W. R. Ashby [26] prefers to explain it in physiological terms as an "homeostatic" process of self-seeking for an absence of imbalance. The various state variables of this cybernetic system concept are unable to respond instantly, producing small-scale oscillations that eventually settle down. Which ever concept is used, it is clear that it is impossible to discuss equilibrium without the need for these stability considerations to be included.

The use of the time-slice representation implies that the global changes that allow for growth (or decline), are introduced **between these short periods**. These changes include exogenous modifications to the 3 pre-set interest rates (with their resulting Prime-Rate returns, interests and dividends) and to the 4 pre-set kinds of taxes. They also apply to the other macro-economic quantities or to their permitted limits, which may have become more-greatly relaxed or tensed, depending on the current behaviour patterns of the society.

Two examples illustrate this business of limitations. The effect of greater investment alone can be disastrous. Without the influence of technological change, the increased taxes, savings and investment, all help to expand the amount of durable goods used as capital in a growing society. Even though there is greater output, the unit-cost becomes higher as the population-density increases and exceeds the optimum for the working conditions. (Examples occur every work-day in morning traffic-jams.) Then the increased number of workers causes a loss in productive efficiency. This is the equivalent of a reduced level of technology. With the lower efficiency, costs and prices inevitably rise and living standards fall. The proportion of unemployment grows, due to the reduction in demand for consumer goods per family unit and the attempts by industry to cut back on its less productive work-force. Thus, this system becomes unstable due to the internal constraints and unbalanced growth. Relaxed constraints are vital for macro-economic progress, which is not possible simply by greater investment alone.

More advanced technology by itself is also not the answer. During the effects of the introduction of improved methods for production (without lessening the

monopolistic restrictions) worsened and de-stabilized the workers' situation. Even today when new technology is included, the results are not much better. The effect of this kind of change lowers both the production costs and the numbers employed, due to the greater productive efficiency. Without monopolistic constraint, the lower prices of the more cheaply produced goods should be capable of stimulating the aggregate demand, providing that the excess work-force is able to earn its living elsewhere. Hence it is by the simultaneous reduction of these limitations (such as easing the mobility of labour, an innovation that is not normally part of Government policy), that good legislation can avoid the inevitable and resulting alternative of unemployment. The disproportional injection of new money into the system is not an acceptable method of compensating for the loss of jobs. Whilst initially raising demand, it subsequently inflates the currency, without actually improving the ratio of wages to prices, as otherwise would be implied by the use of improved production techniques.

Regardless of whether the productive efficiency rises or falls the effect is the same. When the system is in equilibrium and constrained, a disturbance in either direction is destabilizing. This implies that this kind of equilibrium condition is also an optimum one that is created by the system itself. It is due to small changes and therefore linear theory is sufficient for its analysis provided that the time-slices are sufficiently small. To avoid uneven growth, yet still to benefit from the improved production techniques, the restrictions on the other factors of production must be more uniformly reduced. Once urban society has begun to grow, the provision of equal opportunities for access to land and the elimination of certain other more familiar kinds of capitalistic monopoly limitations (see Chapter 16 and Appendix E) are particularly important.

However, in the most general global dynamic terms, before short-term equilibrium is reached, the external (and internal) decision-making conditions (and criteria) will have altered. Due to effects from outside the time-slices, the MESS is thus in a continuous state of fluctuation, equilibrium never actually being attained before the next upset occurs. (Were equilibrium possible, the resulting transition would then appear to be smooth and continuous. This is regarded as the "potential" change [20] of the system and is expressed as a comparatively smooth GDP variation with time.) In modelling the long-term dynamic properties of the system, quantities that were regarded as steady money-flow rates now become "state-variables" and there are inertial lags and other time-dependent functions in the various terms of the Identity-Equations (which have yet be found). The situation may be further complicated by the possibility of temporary instability being present and/or the

existence of more than one point of short-term equilibrium. Reference has already been made to different decisions, which affect the direction of some of the money-flows. Supply-limitations also play a part and there is a need for a non-linear kind of approach with the full dynamics for finding the complete solution. This system includes the use of accumulations as reserves, planned delays and the effect of anticipative decision-making within the entities. It will not be further examined in this analysis, since we are mainly concerned here with the structure of the MESS and the equations for equilibrium within the time-slice.

8.5 The Amount of Information Needed for Solving the Money-Flows

For stable situations, when solving the simultaneous linear equations by mathematics, the number of unknown quantities that can be found is usually the same as the number of equations. Of the 19 flows of money here, three of them depend upon the past accumulations of promises to pay interest and eventually to return the loans. Although these were contractual in the past, these rates are regarded here as exogenous. Four more of them are taxes that are also pre-determined before the time-slice is to be considered. Thus, 12 flows remain to be found, ten of which are based on contractual agreements, one is fully socially obligatory and one is partly contractual and partly socially bound.

Hopefully it should be possible to determine six of the money-flows from the Identity- Equations. However, due to their symmetry as noted in Chapter 7.3, it is found that the equations are singular. This means that one equation can always be obtained by rearranging the other five. Hence, it is possible to determine only five of the 12 unknown flows by this means and the decision-making process must supply the criteria for finding the remainder of them. It might be thought at this stage in the analysis that the problem of obtaining equilibrium is not defined and is incapable of providing an algebraic solution. It will be seen in the analysis to follow that the necessary data is available, but not from the Identity-Equations alone. It is the topology of the system of money-flows that provides additional information. In fact, the problem of determining the money-flows will be seen in a rather different light when these decision-making aspects are examined in the subsequent chapters.

The full number of unknown money-flows may then be taken as determinate from all of the data given above. Were a new entity (such as "the rest of the world", for import and export activities and foreign investment etc.) to be introduced to the MESS, it would permit the addition of one more tax-flow as well as a reasonable number of contractual flows. In practice the maximum number of non-contractual flows preferably should be one less than the total

number of entities. This is because with additional amounts of data, the solution for the contractual flows becomes even more constrained. (It should be noted that the econometric concept of over-specification of any particular state variable has no place in the approach taken here.) The reduction of the number of entities is described in Chapter 7.2.

CHAPTER 9. TOPOLOGY IN DECISION-MAKING FOR
INTERNAL EQUILIBRIUM

9.1 General

In the past when simpler models were in fashion, it was assumed that the external equilibrium is sufficient to define the economic activities. It was thought that this can be derived using selected money-flows* and with the provision that supply equals demand (Say's Law as interpreted by A. Marshall [9] and others). However, this narrow view neglects the question as to what regulates these variables in the first place. As shown above, the six Identity-Equations alone are insufficient for establishing a determinate (and stable) system. Then by implication a separate regime must exist for self-determination within the entities, which is independent of any criterion directly related to their contractual money-flows. To obtain full equilibrium, this additional concept for autonomous control is now introduced into our model by means of the entities' decision-making properties, along with the input/output aspects previously described. This new concept is seen to be highly significant in deriving the various unknown money-flows from our portrayal. Thus the former supply and demand approach, the cutting-edge of past macro-economics now fulfils an ancillary role compared to these freshly added vital considerations, for establishing for the entities, both external and internal equilibrium of the flows.

Within our domain of functional macro-economic analysis, decision-making is found to be an involved subject, there being various processes by which this action is asserted. However its complexity should not belittle its importance; the necessary inclusion of the decision-making features realistically into the system, comprises an essential means for determining how the internal equilibrium is established and maintained. It has been shown that the Identity-Equations incorporate the original money-flows, which enter and leave each entity. Their totals measure the amount of activity within the entity, but their intermittent re-distributions now require the formation and use of certain decision-making properties too. Depending on the timing, location, purpose, polarity and magnitude of the latest disturbance in money-flow, specific corrective actions are performed for absorbing the amounts of these incremental changes into the flows. Each of these five aspects of the flow

---

* Since we are examining the money-flows during a short time slice, it is actually the rate of flow that is being considered, see Chapter 8.2. This applies in all of the following work, but for convenience the term "money-flow" is adopted.

increment then has a specific role to play in this vital process of re-establishing equilibrium.

Suppose that a new money-flow is exogenously loaded into the system, which was previously in a state of equilibrium. This ideal stable condition must quickly be restored by redistributing the effects of the disturbance. During the next time-slice the corrections are generated by the entities and they are added as resulting and restoring increments to the various money-flows. The entities firstly decide on their kind of participation that is needed in making these adjustments, which depends on the money-flow topology or structure of the MESS. The controllers of the entities then choose the proportions of the actives to be expended in the various distribution paths. Hence the decision-making is not simply of a yes/no kind, it requires the reasoned allocation of specific amounts of the total expenditure (for the quantity of goods demanded) and of the income (for the quantity of goods supplied).

This chapter and the two that follow are devoted to clearly explaining in detail how the decision-making process operates within the system. Presented in this chapter are the timing, locations and purpose where decision-making is utilized and has an influence. These are provided by means of both description and diagram. The first thing to be expressed is the decision-making action in terms of two kinds of assertive processes. These are related to the above topology, with the additional effect of the polarity of the flow increments. The decision-making ratios at each money-flow location are defined in terms of their combined effects. Some important relationships between them are given and a summary of the topology in decision-making is provided at the end.

For those who wish to skip the details at a first reading, a summary of the decision- making rules is exhibited at the end of Chapter 10. The results of four simplified numerical examples are described in Chapter 11, with reference to Appendix D, where the details are elaborated. However, the implications of the decision-making are described in greater depth in the following explanation, enabling the reader to better appreciate the need for giving this subject so much attention.

9.2 Decision-Making Blocks and the Topology of the Money-Flows

In Appendix F were presented all of the possible circuits for the making of decisions that stem from an initial flow of money between any two entities. In

that analysis for every branch of each circuit, all of the flows receive equal consideration. But in practice, not all of the flow increments pass into each of these branches in the same proportion, and although it is extensive, the analysis found in Appendix F is inadequate for describing how the various flows actually divide. In order to provide a more satisfactory explanation, some additional information is needed about the influence of certain aspects of the topology of the flows and about the dedication of the particular entity in question. Below the full picture is built up in logical stages, so as to ease the way that these ideas are presented for later use.

The decision-making processes are firstly categorized according to their locations in the Identity Equations (or their directions in the money-flow matrix). The various combinations of the money-flows can lie on both sides of Equations (1) to (6). However we will consider the combinations occurring on only one side. Such a group is then thought to act as a block (the individually of the flows being temporally disregarded) and the decision-making is then termed a "block decision". Two kinds of block decision-making situations arise, which depend on the aim or dedication of the particular block of the entity. The following discussion connects this to the form of the equations, as expressed in the bi-directional matrix of Figure 2 and to its re-arrangement in Figure 4 that follows.

a) Goods-Supply Decision-Making Blocks (Horizontal, Income Related)

   The distribution of the taxable assets, access to land, supplied goods and services, utility of durable capital goods and valuable legal documents (share- certificates etc.) are the reciprocals of the **input money-flows**. These quantities are expressed in terms of the money-flows that appear on the left-hand side of the Identity-Equations (1) to (6) or in the rows of Figures 2 and 4 (to follow). These choices are made by the GOVERNMENT, LAND-LORD, PRODUCER, CAPITALIST and FINANCE INSTITUTION entities only. Except for the first and last-named, (where the decisions are made exogenously outside the time-slice) each of these entities endogenously, contractually and competitively tries to provide the greatest possible value of these goods and services, according to the production costs and the varied money-flow incomes that their customers are willing to pay.

   However, the constraints on the availability of the corresponding amounts of natural-resources, commodities, durables and share-holders' rights, result in these preferences being dedicated according to what is **most worthwhile to supply**. Were all of the requisites to be met, the supply limits would be exceeded (see Chapter 16 and Appendix E), the costs in

many cases having already passed their optimal values. There remains a region for choice of where the necessary supply effort is best expended. The proportions of the supply to these three entities are related, the connections between them being given in the decision-making ratio Equations (9) to (11), that follow in section 9.4. The total of the set of each of the endogenous ratios always equals one. However, for the exogenous decisions this total can differ, when either the FINANCE INSTITUTE or the GOVERNMENT decides to manipulate the total activity of the system, by either printing or destroying money or by adjusting the rules for providing credit, see Chapter 15. Otherwise these two sums must be unity--without changing the amount of the currency in circulation or its equivalent, no other total is possible.

In additional there is an income decision-making function, which is enacted by the GOVERNMENT entity by its pre-set exogenous taxation policy that applies between the time-slices. Equation (8) is presented to cover this. The money-flow is in the same direction here, but there is no supply of goods in return. Instead the threat of coercion is used to extract these tax payments. This is described in more detail in section 9.5. The terms containing the three interest-rate terms $r\mathbf{x}\sum(...)$ are also pre-set exogenously and the subsequent (associated) FINANCE INSTITUTION entity decision-making is covered by Equation (12). However it should be noted that the Prime-Rate of interest **r**, set by the National Bank for the new bonds **M**, also is related by Equation (7) to the dividends on investment.

b) Output-Money Decision-Making Blocks (Vertical, Demand Related)

The distribution of the ***money-flow outputs*** is the reciprocal of the demand for goods and services, labour, access to land, hire of durable capital goods and credit. These quantities are expressed in terms of the money-flows which appear on the right-hand side of the Identity-Equations (1) to (6) or in the columns of Figures 2 and 4 (to follow). These choices are made by the HOUSE-HOLDER, PRODUCER and FINANCE INSTITUTION entities only. Each entity endogenously and contractually tries to obtain the largest practical value of produce, services etc. The limitations on the entity's available income mean that these demands are dedicated to the ***best use that can be made*** of the goods and services so obtained, expressed in terms of the total expenditure.

The demand is restricted by the costs of the purchases, wages, ground-rents, hire-fees and interest as well as by the amounts that actually are

available for use; the sums being determined by contracts, within the supply and demand criteria. Since the income used for the transactions is not fixed, these decisions imply a demand policy after the entities have weighed the choices available. It is both accurate and convenient to express these policies as a set of ratios of the money-flows that occur within each column of Figures 2 and 4. As explained above, the total of each set of these decision-ratios normally is unity. Equations (13) to (15) in section 9.4, cover these three entity's demand decisions.

These two dedicated attitudes to decision-making described above, apply simultaneously. The proposed ratios of **output** money-flows used to buy, employ, lease, hire and invest, give greatest confidence to the suppliers. But the provisional demands as **input** money-flows, enable a preference for the actual produce, services, and share prospects to be anticipated, prior to their supply. This presents a chicken-and-egg situation, neither party is able to claim precedence. In fact, this duality principle is one of the chief (and general) characteristics of the MESS. Unfortunately this basic principle is not often described in modern works on macroeconomics, although it was particularly well-expressed by Henry Hazlitt [19].

Then the block decision-making in our model occurs in a total of eight groupings, six of which are endogenous and two exogenous. Each of the six endogenous decision-makings depend on its block direction (or dedication), being either in a single-sided input (row), in a single-sided output (column), or in one case occupying both row and column as a double-sided decision-maker where one side of the pair is supply-limited, see Chapter 16. The exogenous situations are complicated due to the particular and related natures of the entities, see section 9.5.

9.3 Graphic Expression of the Topology of Decision-Making

An alternate way of presenting the decision-making situation is shown in Figure 4 (on next page), which is based on the money-flow matrix of Figure 2 after some rearrangement. (The order of the rows and columns has been altered, so that the decision-making terms lie on a row or column, mostly without a pre-set term laying in-between. This makes the block relations between the terms easier to envisage. However from both a topological and a mathematical viewpoint there is no difference, the order of the rows and columns being arbitrary provided that they are the same in each direction.)

FIGURE 4. DECISION-MAKING BLOCKS IN THE RE-ARRANGED MATRIX (MONEY-FLOW TOPOLOGY)

COLUMN\ROW OUTPUTS\INPUTS	G	F	C	L	P	H	TOTALS (Kinds of inputs)
GOVERNMENT G	\	M	Tc	Tl	Tp	Th	**GNB** Bonds, Taxes
FINANCE INSTITUTION F	rΣ(M)	\	riΣ(I)			S	**FIC** Interest, Yield Savings
CAPITALIST C		I	\	Hl	Hp	Hh	**CPL** Hire-Fee Investments
LAND-LORD L				\	Rp	Rh	**LRN** Ground-Rents
PRODUCER P	Cg		Cc		\	Ch	**GDP** Purchases
HOUSE-HOLDER H		rsΣ(S)			Wp	\	**Y** Interest, Wages
TOTALS	GNB	FIC	CPL	LRN	GDP	Y	

In Figure 4, the three endogenous money-input (goods-supply) decision-making blocks are shown within the horizontal shaded frames and the three endogenous money-output (goods-demand) blocks by the vertical triple-line boarders. The two exogenous-active blocks consist of the four taxes and two (out of three) interest-rate dependent terms, these blocks being income related, both vary outside of the time-slice and their single-line boarders are without shading.

Of the twelve endogenous flows three are solely from the inputs **Hl** , **Cg** , **Cc** and three are solely from the outputs **Wp** , **S** and **M** . The remaining six flows **I** , **Hp** , **Hh** , **Rp** , **Rh** and **Ch** relate to ***both input and output decisions***. These locations are given the name "cross-over stations" and they find use in describing below some of the resulting actions. Due to their positions within the limited number of Identity-Equations, not all of the values of the eleven contractual (and one mainly-obligatory) money-flows can be directly determined. However, the decision-making criteria introduced here, do provide some additional relationships that enable the changes in the unknown quantities to be connected and analyzed.

9.4 The Decision-Making Ratios of the Entities--Definitions and Relationships

The basic situations considered below, relate to where a number of values occur on one side of a particular Identity-Equation. This is due to the nature or topology of the system. From Figure 4 it was seen that the decision-making money-flows fall into eight groupings or blocks. We will consider what happens when a combination of flows previously in equilibrium, is disturbed by the introduction of a small increment (such as a new rate of taxation). Each term within a decision-making block can respond by taking a proportion of the resulting change. Regardless of whether goods or money is being demanded or supplied for each term, these decisions are expressed as a ratio or derivative (in mathematical language). They are envisaged here in the form of partial-differential coefficients with respect to the total input or output of the block, (expressed here in the form of $\partial\ldots/\partial\ldots$, where the prefix ∂ is before the flow quantity **...** which is inside the expression and may be regarded as a time-dependent variable). For convenience each decision-maker is abbreviated by introducing a δ prefix and using either curly brackets for **{horizontal blocks}** or square brackets for **[vertical blocks]**, as shown below. The use of both exogenous and endogenous blocks is possible, provided that they are not mixed. Except where noted below, all of the definitions apply to endogenous blocks.

Definitions of the 15 Decision-Ratios of Input Money-Flows **{horizontal blocks}**

GOVERNMENT: **{δTl}** = $\partial Tl/(\partial GNB - \partial M)$, **{δTp}** = $\partial Tp/(\partial GNB - \partial M)$,
 (all exogenous) **{δTc}** = $\partial Tc/(\partial GNB - \partial M)$, **{δTh}** = $\partial Th/(\partial GNB - \partial M)$,
  these 4 taxes are pre-set, the changes occurring between the time-slices.
LAND-LORD: **{δRp}** = $\partial Rp/\partial LRN$, **{δRh}** = $\partial Rh/\partial LRN$.
PRODUCER: **{δCg}** = $\partial Cg/\partial GDP$, **{δCc}** = $\partial Cc/\partial GDP$, **{δCh}** = $\partial Ch/\partial GDP$
CAPITALIST: **{δHl}** = $\partial Hl/\partial CPL$, **{δHp}** = $\partial Hp/\partial CPL$, **{δHh}** = $\partial Hh/\partial CPL$,
        {δI} = $\partial I/\partial CPL$.
FINANCE
 INSTITUTION: **{δr∑(M)}** = $\partial r\sum(M)/(\partial FIC - \partial S)$,
(both exogenous) **{δri∑(I)}** = $\partial ri\sum(I)/(\partial FIC - \partial S)$, these being pre-set.

Definitions of the 9 Decision-Ratios of Output Money-Flows **[vertical blocks]**

PRODUCER: **[δRp]** = $\partial Rp/(\partial GDP - \partial Tp)$, **[δHp]** = $\partial Hp/(\partial GDP - \partial Tp)$,
          [δWp] = $\partial Wp/(\partial GDP - \partial Tp)$.
HOUSE-HOLDER:**[δRh]** = $\partial Rh/(\partial Y - \partial Th)$,   **[δCh]** = $\partial Ch/(\partial Y - \partial Th)$,
          [δHh] = $\partial Hh/(\partial Y - \partial Th)$,   **[δS]** = $\partial S/(\partial Y - \partial Th)$.

CONSEQUENTIAL MACROECONOMICS

FINANCE
 INSTITUTION: $[\delta M] = \partial M/(\partial FIC - \partial rs\sum(S))$, $[\delta I] = \partial I/(\partial FIC - \partial rs\sum(S))$.

Where two terms are in the denominator, it is because the side of the Identity-Equation laying opposite to the decision-making block has an additional input or output quantity. The pre-set input quantities denominators have a term derived from bonds **M** , **s**imilarly the pre-set output quantities have denominators derived from taxes **T...** or interest on savings **rs∑(S)** . One of these increments may be equal to zero, however many of the derivatives do exist and the full expressions have been retained here because they have not yet been eliminated.

These sets of derivatives or ratios correspond to the block decision-making classes a) and b) of section 9.2 respectively. Without the 4 taxation and the two exogenous interest-rate pre-sets, sets of nine endogenous decision-making ratios occur in both the horizontal and vertical directions. Ratios that have the same letters but not the same kind of brackets are not equal. From Equations (1) to (6) and their totals, the sum of each set of decision-making ratios equals 1, hence for the 5 input blocks:

GOVERNMENT (exogenous):   **{δTl} + {δTp} + {δTc} + {δTh} ≈ 1**   (8),
LAND-LORD: **{δRp} + {δRh} = 1**   (9),
PRODUCER: **{δCg} + {δCh} + {δCc} = 1**   (10),
CAPITALIST: **{δHl} + {δHp} + {δHh} + {δI} = 1**   (11),
FINANCE INSTITUTION (exogenous):   **{δr∑(M)} + {δri∑(I)} ≈ 1**   (12).

<u>Note:</u> that the ≈ or approximately equals symbol, applies where these 2 entities may add or take money to/from the system, see Chapters 10, and 15.

Here in considering the exogenous decision-making, the equations are equal to unity only when the entity involved does not try to control the amount of activity within the system, as previously mentioned and described in Section 9.5. For the 3 output blocks:

PRODUCER: **[δRp] + [δHp] + [δWp] = 1**   (13),
HOUSE-HOLDER: **[δRh] + [δCh] + [δHh] + [δS] = 1**   (14),
 FINANCE INSTITUTION: **[δM] + [δI] = 1**   (15).

Originally, from section 9.3, each of the six (endogenous) cross-over decision-making money-flow terms occurs in two groups. The decision-making ability of the associated entities depends on the values of these

twelve ratios, based on technical criteria. These ratios are related by the following equations, which ensure that the products of the differential money-flows are identical:

LAND-LORD/PRODUCER: ∂**LRN** x **{δRp}** = (**∂GDP – ∂Tp**) x **[δRp]** (16),
LAND-LORD/HOUSE-HOLDER: ∂**LRN** x **{δRh}** = (**∂Y – ∂Th**) x **[δRh]** (17),
PRODUCER/HOUSE-HOLDER: ∂**GDP** x **{δCh}** = (**∂Y – ∂Th**) x **[δCh]** (18),
CAPITALIST/PRODUCER: ∂**CPL** x **{δHp}** = (**∂GDP – ∂Tp**) x **[δHp]** (19),
CAPITALIST/FINANCE
                 INSTITUTION: ∂**CPL** x **{δI}** = (**∂FIC – ∂rs$\sum$(S)**) x **[δI]** (20),
CAPITALIST/HOUSE-HOLDER: ∂**CPL** x **{δHh}** = (**∂Y – ∂Th**) x **[δHh]** (21).

The other six decision-making ratios, namely **[δM]** , **[δS]** , **{δHI}** , **{δCg}** , **{δCc}** and **[δWp]** are also from the flows of section 9.3 , but they do not cross-over. In common with the four exogenous taxation policy-making ratios **{δTc}** , **{δTl}** , **{δTp}** , **{δTh}** the two exogenous interest-rate terms **{δr$\sum$(M)}** and **{δri$\sum$(I)}** are independent. (The third interest rate term **δrs$\sum$(S)** , is also regarded as being independent and may be written without the external brackets since it does not form a decision-making block.)

Equations (16) to (21) provide 6 solutions for the transfer terms, (in the square brackets) that may used in Equations (9) to (11) and (13) to (15). Since the tax-flow increments are exogenous with the interest-rate flows (and consequently they are not subject to these manipulations), substitution of the transfer terms reduces the number of unknown flow increments to 8 (there being a total of 19 variables and only 11 effective equations). This is less than the number of undetermined values as found in Chapter 7.3 for the situation with the Identity-Equations (1) to (6). However and of more significance, the numerical values of all of the flow increments here may be determined by making comparisons of the results taken from previous time-slices with the current ones, whilst satisfying Equations (8) to (21).

9.5 Entities Having Special Features in Decision-Making

There are four entities having certain complicating aspects, which make their decision-making more involved. They are the PRODUCER, GOVERNMENT, HOUSE-HOLDER and FINANCE INSTITUTION entities, each of which is considered below.

CONSEQUENTIAL MACROECONOMICS

a) Double-Sided Decisions of the PRODUCER Entity

This entity has the special situation of the decision-making blocks laying on both sides of its Identity-Equation. They are normally adjusted together. The PRODUCER entity is therefore considered to occupy a double-sided decision posture. But for certain limitations in the supply of the three factors of production (to be described in Chapter 16), the topology would allow this entity complete freedom, to autonomously develop both sides of its Identity-Equation and to flourish unimpeded. But two of these limitations are located within the circular flows due to symmetry about the leading-diagonal (Table 6, flows P-C and P-H), where their influence as multipliers (see Chapter 7) is strongly constrained.

In practice when the PRODUCER entity operates in a double-sided way, the strength of an incoming increment can affect both sides. This is because it is necessary to not exceed at least one of the three possible limitations in the associated supplies, see Chapter 16. Then the restricted actions can proceed in both blocks.

b) Exogenous Pre-Set GOVERNMENT Entity and its Related Decisions

For this entity the decision-making is in a single-sided block that is split in two parts. The tax terms are pre-set exogenously between the time-slices, but the sale/purchase of bonds, which are used to cover the National Debt, are transacted within the time-slice. Both of these input flows lie opposite the GOVERNMENT entity expenditure **Cg**.

This entity formally deals in the new bonds **M** , which are often used to adjust its degree of investment in public works and the expenditure **Cg** on them. It does so by controlling the size of the terms on both sides of its Identity-Equation. This unique aspect of macro-economic decision-making enables the GOVERNMENT entity to attempt to enliven a depressed economy (or to try to restrain a rapidly growing one, by the reverse action). There are practical limits to the intensity of this action, however it may be spread over many time-slices.

In practice the exogenous pre-set Prime-Rate of interest (the value of **r** in the $r\sum(M)$ term) on bonds (or loans) to the GOVERNMENT entity, may also be used for control of the degree of general activity in the system. The value of **r** influences the response during the succeeding time-slice for all 3 kinds of investment. It is necessary that either the interest-rate **r** be pre-set, or the quantity of new bonds **M** be fixed in this period, but not both. One of them should be left free, due to their strong mutual inference,

as described in Chapter 7.4.4 and by Equation (7). When $r\sum(M)$ is adjusted there is a tendency for the other two **r** dependent terms in **S** and **I** to follow the change, where the differences between them, due to the factors **s** and **i**, allow for bank gains and the comparative degrees of risk, (growth or decline) of the stock-market. These factors on **r**, as introduced in Chapter 7.4.4, provide a way to handle this effect.

c) The HOUSE-HOLDER Entity's Output Money-Flow Choice

This entity has the unique ability to behave in a manner that is not symmetric with regard to the polarity of the incoming increment. When less wages are paid or an additional income tax is demanded from this entity, the available purchasing-power drops. The normal response is for the entity to reduce savings but not consumption. However when there is a reduction in taxation or an increase in wages and consequently to income, this entity is more likely to spend the excess on more luxurious consumer goods rather than to save it. Thus the non-linear behaviour depends on the sign of the increment. This trend is insufficient to explain how any money gets saved at all, because the continuous fluctuation in income implies that consumption always dominates savings. However, it should also be remembered that within the time-slice, the effect of an increased rate of interest results in more getting saved; whereas when the rate of interest is reduced the HOUSE-HOLDER does not automatically decide to save less.

d) Exogenous Pre-set FINANCE INSTITUTION Entity Decisions

The National Bank followed by the rest of the banks, have a measure of control that is independent of the GOVERNMENT, at least for a short time. They exercise this by adjusting the rates of interest that they pay on supplied savings or what they receive on credit demands, both of which are different to the Prime-Rate. When this is adjusted these two bank-rates also change. The terms $ri\sum(I)$ and $rs\sum(S)$ include factors that are related to their relative benefit or risk respectively, which are sensitive to the performance of the stock-market (that itself depends on the yield on past investments) and to the willingness of savers and creditors to accept the difference in interest between the amounts loaned and borrowed. Due to Equation (7) as described above, the GOVERNMENTAL behaviour is modified, after the amounts of **I** and **S** of the previous time-slice have caused their accumulated totals to vary disproportionately. The form of Equation (7), can have a significant effect on the way that the National Deficit changes, on the value that the Prime-Rate is re-set, or on the degree that the currency is "allowed" to inflate.

There are three diagonally symmetrical sets in Chapter 7.4 that contain the return of interest on various forms of investment and savings. These pre-set interest-rate related flows **r∑(M)** , **ri∑(I)** and **rs∑(S)** do not constrict to the same extent as the supply limitations, but they do complete the circuits for future investment. In common with the first three diagonal relationships, they are adjusted by the exogenous actions described above.

Using these various kinds of decisions particularly the exogenous ones, step changes are introduced, that do not vary continuously with time. Consequently, the development and growth of the MESS is not a steady exponential function. The average rate of growth of the potential GDP might otherwise be expected to follow this kind of smooth curve with time, as a result of the first-order differential equations described in Chapter 7.3. Instead it will change in a series of shocks, some of which are violent, as the system responds to various combinations of these exogenous influences. This may even include a between time-slices change of the kind of regime that determines the supply limits, to be described in Chapter 16.

9.6 Summary of Topology of Decision-Making Activities

Using Figure 4, it was shown in the discussion that eight decision-making blocks occur in the MESS. These blocks contain the following three kinds of money-flow increments. Further, in Table 7 these blocks of flows are categorized into three decision-making kinds. The significance of these arrangements will be seen in the next chapter.

TABLE 7 CATEGORIES OF ENTITIES HAVING BLOCKS OF DECISION-MAKING MONEY-FLOWS (OPPOSING FLOWS OMITTED)				
ENTITY LETTER AND EQUATION NUMBER	EXOGENOUS	ENDOGENOUS BLOCKS		
	PRE-SETS: TAXES OR RATES OF INTEREST (ROWS ONLY)	VARIABLES: INPUT SUPPLY (IN ROWS)	VARIABLES: OUTPUT DEMAND (IN COLUMNS)	CATEGORY OF THE BLOCK, OF THE ENTITY
L 1 G 2 H 3 P 4 C 5 F 6	**Tl Th Tp Tc** **rs∑(S)** **r∑(M) ri∑(I)**	Rh Rp **Cg Cc** Ch **Hl** Hp Hh I	 Rh Ch Hh **S** Rp Hp **Wp** **M** I	SINGLE ROW SINGLE ROW SINGLE COLUMN DOUBLE-SIDED SINGLE ROW SINGLE COLUMN

PRE-SET EXOGENOUS FLOWS: Obligatory taxes **Tc** , **Tl** , **Tp** , **Th** and the rate of interest dependent flows **r∑(M)**, **ri∑(I)** and **rs∑(S)**, that are not allowed to vary during the subsequent decision-making processes within the time-slice of the MESS.

SIMPLE ENDOGENOUS (SUBSTITUTE) FLOWS: Flows that have a single-direction decision-making connection with either their respective row or column: **M** , **S** , **Hl** , **Cg** , **Cc** and **Wp** . These six flows are decision-related solely due to either inputs or outputs in either the shaded or triple-bordered blocks of Figure 4 and they are allowed to vary only within the time-slices.

CROSS-OVER FLOWS: Contractual flows that share a common decision-making connection with both the rows and columns in which they occur: **I** , **Hp** , **Hh** , **Rp** , **Rh** and **Ch** . Occurring between pairs of the entities, these six flows are decision- related to both inputs and outputs. In Figure 4 these flows have both shaded and triple-lined border indications. They may be regarded as cross-over or transfer stations on the decision-making map.

To summarize in terms of the Identity-Equations, Table 7 is prepared. It shows that the PRODUCER entity, Equation (4), has blocks on both its input and output sides. This entity is always limited in what it can supply (see Appendix E). Cross-over or transfer flows appear twice in the table and are in an outlined-letter format, all others appear once.

Equation (2) is that of the GOVERNMENT entity, which plays a role in the decision-making between the time-slices, due to its pre-set (exogenous) block associated with the taxation policy. Except for the PRODUCER, the other four equations have but one endogenous block each, two on the input and two on the output sides. Equation (6) for the FINANCE INSTITUTION has both exogenous and endogenous blocks. They apply at different times, in the same manner respectively, as was explained above for the two separately lying blocks within the GOVERNMENT and PRODUCER entities.

CHAPTER 10. THE ACTIONS AND RULES OF DECISION-
MAKING

The previous stage of the analysis (in Chapter 9) mainly discussed the locations used in the decision-making process. In this chapter, we deal with the second important topic of decision-making, which is the definition and execution of the associated actions. There are only two kinds of actions used in decision-making and their basic nature is easy to understand, due to their close relationship with the Identity-Equations. To appreciate how these two autonomous actions are contained within the system and executed by it, the criteria for their choice must be examined too. This covers the re-distribution of all the specifically imposed money-flow increments, including the effect of flow limitations. The location, direction (purpose), polarity (sign) and magnitude of every increment of money-flow, are taken into consideration here.

It is found that the decision-making process necessarily includes certain directional properties of the variables, which permit the procedures to be considered in a logical manner. This is explained by the introduction of some rules for the distribution of the various increments and the way that they are connected to the entities. The parts of the logic are conveniently expressed in a table, which involves the method for choosing which decision-making procedure is to be used. The final results, for all the possible decisions when using this method, are also presented in a summary table.

10.1 The General Response to Upsets and Sequencing Considerations

After an increment of money-flow has been exogenously inserted into the money-flow matrix, the equilibrium of the flows is instantly upset. This initial disturbance may occur on any of the 19 flow terms. Since this position is not on the leading diagonal, two entities are affected and the disturbing influence passes along two paths, on the row and column of the arrival location. Each component will follow a sequential procedure and they can be considered to have "motion" in each of these orthogonal directions. (Alternately when we consider this effect acting on the Identity-Equations, the extra money-flow increment is seen to occur twice, on the opposite sides of different equations.) The two entities involved take the necessary decisions for immediate endogenous re-adjustment. Consequently, for equilibrium to be re-established, the stabilizing procedures always occur simultaneously in pairs.

In duly considering each entity, the related money-flows are quickly modified, to eliminate the local effects of the disturbance and to restore the state of equilibrium. However this timely action only partly regains the system stability, because on a smaller scale its action then leaves unsatisfied the equilibrium of many other entities. These smaller disturbances also are re-adjusted similarly within the same time-slice. The repetition of this process ensures that subsequent incremental totals eventually become equal on every row and corresponding column.

As described in Chapter 8, a certain fraction of the disturbance returns to its point of origin. With many parallel loops in the system, the size of the associated multiplier-factor is relatively small. Then the circuit is insensitive to the effect of the increment and the associated loop requires comparatively little iteration to reach a specific degree of stability. (For circuits having a smaller number of loops and increased sensitivity, more cycles are needed.) However, whatever multiplier-factors are actually available, eventually the decreasing-sized disturbances will completely dissipate over the entire system, to return it to a state of equilibrium once again.

The actions for this process of adjustment, replace one component of a money-flow increment by one or several others. They are expressed here as an extension of the topological aspects of the decision-making, which were described in the last chapter. The subject is broached on the same basis as before, namely on the kind of location where an increment of disrupting money-flow is being applied, as indicated in Table 7. The difference being that now our attention focuses on how the various decision-making blocks can accommodate the extraneous flow, which may be of positive or negative polarity. In the following description, the response to a positive flow increment is first considered.

10.2 Balancing and Substitution Actions Taken in Decision-Making

There are but two possible basic actions for making such a re-distribution. The effect of each increment's component either can be opposed by balancing or neutralized by substitution. Balancing is done by placing money-flows on the complementary side of the entity's Identity-Equation, to oppose the effect of the disturbance. Substitution is performed when some alternative flow increments are removed from the same side of the entity, to neutralize the disturbing effect. It is assumed that the values of the decision-making ratios are already known, see Chapters 9 and 12.

CONSEQUENTIAL MACROECONOMICS

a) Balancing

Suppose that the irregularity arrives on a single money-flow term that lies opposite to a decision-making block within the Identity-Equation (or it opposes a single flow term, which for present purposes behaves in the same manner). This opposite-laying block (or term) is located along the complementary row or column of the entity. Since the sums of all the terms in this row and in the corresponding column must be equal, the supposed "motion" of the disturbance can be transposed at the leading-diagonal, into the path laying along this block. Subsequently, the equilibrium of the entity is restored by the additional of fractional incremental flows into the block (or term), to balance the influence of the new arrival.

By this procedure a number of equilibrating fractional money-flow increments are introduced, one fractional flow being placed on each term in the block. The size of each of these fractions is determined from multiplying in turn, the disturbing increment by the decision-making ratio of the particular term (see Chapter 9.4). The resulting corrections are then added arithmetically to the previous values of the flows within each term of the block. In the case of the single flow term, being opposite the arrival point, the same process takes place, but it uses the full increment.

Since the sum of each set of decision-making ratios is unity, (see Equations (8) to (15) in Chapter 9), the disturbing effect of the arrival increment is fully covered, after this process is applied to the entire block. However, if one of its flow terms is found to be supply-limited before all of the fractional increment has been added, then the excess flow is spread between the other flow terms in the block, by the substitution procedure to be described below (and if only one term remains, then all of the fractional excess is transferred to it.)

The overall effect of balancing is that the disturbing macro-economic activity is duplicated and thereby opposed, the effects being applied on the other side of the Identity Equation of the entity and possibly spread over its block. The results of this are the creation of smaller disturbances over more of the system. On the matrix, they continue to act in the same direction as was taken by the original disturbance, which is at a right-angle to that in which the block lies.

b) Substitution

Now suppose instead that the irregularity arrives directly on a money-flow term laying inside the decision-making block of an entity. In this case, the motion of the disturbance is at a right-angle to the block's direction. Then the unstable influence of this flow increment can be neutralized by substitution by placing suitable fractions of the money-flow increment of opposite sign, at the remaining positions within the block (the newly-arrived increment having "occupied" the first position).

The size of each term's contribution that absorbs the effect of the disturbing increment, is in proportion to its decision-making ratio. This ratio is now compared to the sub-total remaining within the block, after omitting the value of the ratio at the arrival flow term. Unlike balancing, this process cannot take place when there is only a single money-flow term involved (when instead, the increment is completely balanced on the opposite side of the entity). The sum of these substitution adjustments is made of equal size but opposite in sign to that of the new arrival.

The overall effect of substitution is that the disturbing macro-economic activity is eliminated, along the particular direction of the block or on one side of the Identity Equations. In common with the balancing increments, the resulting effects are now spread as smaller disturbances over more of the system and they act in the direction at a right-angle to the block.

It should be noted that when substitution is not possible, balancing must always take its place. There is no other alternative to this bi-directional two-way decision-making process, which spreads the fractions of the flow increments over the system. The application of these two alternative methods is now placed within the general context of the whole MESS, before explaining how to decide which one to use.

10.3 Further Matters Concerning the Process of Re-Distribution

10.3.1 Separation and Placing of the Exogenous and the Endogenous
Actions

An arbitrary number of exogenous disturbances may be introduced into the system, between the time-slices. They behave arithmetically and four of them at least, are super-positioned in a linear manner. (Two exceptions to this were described in Chapter 9.5, on which their effect is also elaborated below.) The initial actions simultaneously have components in both in row (input) and

column (output) directions. The expression of these effects is subsequently taken endogenously within the time-slice. Since the components of the disturbance now have been separated, the resulting motion brings them to the 12 endogenous terms only. Consequently, the former exogenous terms (the four kinds of taxation and the three rates of "interest" that are proportional to r) are skipped-over within this finite interval of passing time.

In general the exogenous disturbance may be placed on any of the four pre-set taxes or on the three pre-set rates of return of interest r which usually act together. It is also possible for it to be applied at any of the 12 contractual money-flows that are otherwise free to vary within the time-slice. However, unless the policy of the GOVERNMENT is to control the free operation of the system, this kind of action is not normally performed. It would be either the result of an unlikely national disaster, such as a general labour strike, plague, war, large-scale floods, a severe earthquake, or a national moratorium on debts. Alternately it might be due to a rare opportunity for progress, such as the discovery of massive lode of useful and accessible mineral, a faster trade-route, the development of an outstanding technical lead, or the arrival of a large number of industrious immigrants. Normally these 12 money-flows will vary more slowly, without exogenous change, by the new and continuing contractual agreements between the various entities.

10.3.2 Negative Incremental Values

These two procedures also apply to negative values of the money-flow increments, which are developed as the disturbance spreads over the system. The negative sign is a convenient mathematical means of denoting that the flow increment leaves a term in the block (or equation) instead of entering it. However, this increment is not regarded here as a "new departure", because of the need to preserve the order of treating these changes, regardless of their sign. Instead, this order is expressed by the same concept of their having motion, as described above.

A negative disturbing increment produces contrary effects on almost all of the overall economic activity--with certain variables S , M and I being capable of adopting negative flow values, but the rest of them necessarily remaining as smaller positive quantities. When one component of a negative disturbance acts on the same row or column as a positive disturbance, their strengths cancel, partially or totally, thereby reducing the number or magnitude of the changes remaining.

10.3.3 Changes in Total Macro-Economic Activity

During a balancing action, the amount of total macro-economic activity will change. It will increase for a positive increment and reduce for a negative one. However, the action of substitution replaces one increment by another without the total amount of activity being affected. Thus, when there is economic growth in a MESS, it is due only to the result of positive balancing actions and an economic contraction is the sole consequence of the balancing of negative increments. After the flow increments have stabilized, all of their values may be added or subtracted from the previous stable set of money-flows, at the end of the time-slice.

10.3.4 The Upper and Lower Limits of the Money-Flows (of Chapter 16)

There are lower and upper limits to the size of many of the money-flows, beyond which the above kinds of actions need to be modified. Regarding the lower limits, when balancing with negative flow increments, or when substituting with positive ones, the magnitude of the total resulting money-flows should remain positive (with the three exceptions in section 10.3.2). For the upper limits, as previously mentioned, a substitution or a negative balancing is needed, when the size of the resulting total positive money-flow exceeds a particular supply-limit.

Once the limit is reached it is necessary to re-distribute the fractional flows, regardless of the kind of decision-making procedure that was previously used. The excess of the fraction should be spread proportionally between the other active flows in the same block, or in the case of one flow, it is transferred and balanced on the opposite side of the entity.

10.3.5 The Motion of the Endogenous Actions for Decision-Making

Regardless of the kind of decision-making taken on the block, it is seen that the resulting motion of any departing fraction is always at right angles to the block's direction. After a substitution has been made, the signs of these fractional flows are reversed, as explained above. This brings them to the next location of decision- making (except for the cross-over stations, where no re-location is necessary).

It is the combination of topology (due to the numerous loops, as listed in Appendix F) with the decision-making criteria and their actual ratios, that determine the distribution of these correcting flow effects. This stabilizing process re-iterates, the resulting chain-reaction rapidly spreads diminishing-

sized fractions of the increments over the entire matrix. It will eventually eliminate the last remnant of any disturbance to the equilibrium of the system.

10.4 The Choice Between Balancing and Substitution

When a component of incremental disturbance arrives on a money-flow term, it is necessary to decide upon the kind of action to be performed. Section 10.2 describes the actions of balancing and substitution themselves, but the means of knowing which one to use has yet to be provided. Certain responses were determined in Chapter 9.2, where the preferential or ideal directions (or dedications) of the decision-making blocks were described. However, not all of the entities have blocks laying in the direction of motion of the disturbance, where a direct response by the particular entity is possible. Only the PRODUCER entity with its double-sided decision-making freedom of choice, performs in this manner, all the other entities have but one decision-making block able to resist this action. In fact, the criterion for making this choice depends on three aspects of the increment. These are the place of its arrival, its sign and the direction of its motion relative to the block.

Consider this situation from the viewpoint of the double-sided PRODUCER entity. For the "row" or income money-flows, the motivation is to expand on the sums exchanged for the goods and services, whose volume is limited only by what can be supplied. Consequently, when the block is located on the input side of the Identity-Equation (row of the matrix) and the arriving increment is positive, then the decision-making is by balancing.

No PRODUCER will willingly refuse the opportunity for a greater income, by deciding to substitute instead, unless it is from an exogenous action of the GOVERNMENT occurring between time-slices, or when it is the consequence of the PRODUCER'S limited access to supplies or resources. However, when the flow increment is negative due to a diminished demand of a specific kind, the input side of this entity will always elect for the substitution of the same effort into a different commodity, rather than to reduce the extent of its overall activity.
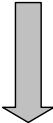
In contrast to the above, for the orthogonal "column" or output expenditure money-flows, the PRODUCER entity's demand for the various factors of production is motivated by the need to obtain from them the greatest utility. So when the decision-making block lies on a column of the matrix, the corresponding ideal response to positive flow increments is a decision to substitute. Having a certain sum to spend, this entity aims to buy, hire, lease

or employ only what it can best afford and use, rather than to waste purchasing-power in less practical utilities, because their consequence is smaller amounts of economic activity. For flow fractional supply-increments that are negative in sign this action is reversed.

Then the output side of the PRODUCER entity will always opt for reductions in its demand-utilities by balancing (as shown in the right-hand two columns of Table 8), because this action is the best that can be achieved. The effect of balancing on the amount of macroeconomic activity (section 10.3.3) is indicated in this table by + (greater) and – (smaller). Substitution does not affect this characteristic feature.

TABLE 8 CRITERIA FOR DETERMINING THE KIND OF DECISION-MAKING, AFTER A FLOW INCREMENT ARRIVES				
WHEN THE SIGN OF THE MONEY-FLOW INCREMENT IS:	HAS THE FLOW-INCREMENT ARRIVED ON A BLOCK HAVING ANOTHER DECISION-RATIO GREATER THAN ZERO?			
	IF **NO,** THEN:	IF **YES,** THEN:		
		IS THE ARRIVAL POINT ON ONE OF THE DOUBLE-SIDED PRODUCER BLOCKS?		
		IF **NO,** THEN	IF **YES,** THEN:	
			FOR INPUT BLOCK	FOR OUTPUT BLOCK
POSITIVE	BALANCE +	ALWAYS	BALANCE +	SUBSTITUTE
NEGATIVE	BALANCE –	SUBSTITUTE	SUBSTITUTE	BALANCE –

On the blocks of the less adaptable single-sided entities, only certain kinds of decisions are possible. They are included in this table, which specifies the topological and action aspects of the decision-making. Using this table, the subsequent results of all the possible kinds of endogenous decision-makings are summarized in Table 9, to follow.

The four ways that these decisions relate to all the 19 associated money-flows, results in there being a total of 76 kinds of decisions, with 6 of them being exogenous decisions (and the rest are endogenous.) The action of taking an exogenous decision initially is indeterminate, at least by these rules! It is made by both the GOVERNMENT and the FINANCE INSTITUTION entities in regard to their input money flows only[*]. Should these entities decide to change the amount of one kind of taxation or to adjust the Prime-

---

[*] In Chapter 15.4 the special nature of theses two entities in regard to money is presented using a different terminology.

Rate of interest, then the totals in Equations (8) and (12) will not equal one. In these circumstances this is temporally acceptable. The other endogenous decisions, (which have total decision-ratios that must equal one) help to stabilize the secondary disturbances that result from the initial (exogenous) upsets. In Table 9 there are a number of pairs of decisions (where the column is not divided into two). These decisions are due to the fact that the single term arrival point has no other term in its arrival direction, so regardless of the sign of the increment the decision must be the same. Due to the possibility of zero decision-making ratios, substitution is not always possible. Then the alternative of balancing must follow.

TABLE 9 SUMMARY-- FULL LIST OF THE CHOICES FOR DECISION-MAKING				
ARRIVAL MONEY-FLOW TERM	INPUT (ROW) ENTITY AND DECISION TYPE		OUTPUT (COLUMN) ENTITY AND DECISION TYPE	
	POSITIVE INCREMENT	NEGATIVE INCREMENT	POSITIVE INCREMENT	NEGATIVE INCREMENT
Th	G BALANCE	G SUBSTITUTE*	H SUBSTITUTE ø	
Tl	G BALANCE	G SUBSTITUTE*	L SUBSTITUTE	
Tp	G BALANCE	G SUBSTITUTE*	P SUBSTITUTE	P BALANCE
Tc	G BALANCE	G SUBSTITUTE*	C SUBSTITUTE	
Rh	L BALANCE	L SUBSTITUTE	H SUBSTITUTE	H BALANCE
Rp	L BALANCE	L SUBSTITUTE	P SUBSTITUTE	P BALANCE
Hp	C BALANCE	C SUBSTITUTE	P SUBSTITUTE	P BALANCE
Hh	C BALANCE	C SUBSTITUTE	H SUBSTITUTE	H BALANCE
Hl	C BALANCE	C SUBSTITUTE	L BALANCE	
Wp	H BALANCE		P SUBSTITUTE	P BALANCE
Ch	P BALANCE	P SUBSTITUTE	H SUBSTITUTE	H BALANCE
Cc	P BALANCE	P SUBSTITUTE	C BALANCE	
Cg	P BALANCE	P SUBSTITUTE	G BALANCE	
M	G BALANCE		F SUBSTITUTE	F BALANCE
r∑(M)	F BALANCE	F SUBSTITUTE*	G BALANCE	
I	C BALANCE	C SUBSTITUTE	F SUBSTITUTE	F BALANCE
ri∑(I)	F BALANCE	F SUBSTITUTE*	C BALANCE	
S	F BALANCE		H SUBSTITUTE	H BALANCE
rs∑(S)	H BALANCE		F BALANCE	

*   Exogenous decision (all the others are endogenous), also see previous page.

ø Here the decision ratios also depend on the sign of the increment, see Chapter 9.5.c.

10.5 The Ethical Behaviour Implications (see Assumptions in Chapter 3.5)

By this arrangement, the Macroeconomics System always seeks to achieve the best economy of activity, which is in keeping with the following natural axiomatic rule. *Our society **generally tries to obtain the greatest benefit from the engagement of the least effort**.* The exceptions to this rule are when monopolistic or political forces manage to alter it to favour certain parts of the society. Inevitably, this infraction leads to losses in economic efficiency, if it does not cause worse disasters. The overall result of the dual-direction process described above, is that the satisfaction of Man's unending desires is normally achieved within the MESS, by the use of the least-necessary amount of productive resources (of the most-readily available kind). These are taken from artificial, human and natural origins; from the use of durable capital goods, labour and access to the land. However, when biased micro-economic considerations are imposed, this kind of behaviour is not necessarily implied, nor does it have to be true.

From Table 8 it is apparent there is a certain asymmetry in the system's decision- making. This is better depicted in Table 9, by the fact that the number of income balancing decisions total 19 positive and only 4 are negative, whilst the output ones number 6 positive and 15 negative. Then the total positive ones exceed the total negative ones. It is this feature of the MESS that reflects our entrepreneurial nature, to better the macro-economic role that we play in society as we attempt to raise our living standards. This is this quality that converts the "dismal science" of macroeconomics into an expression of optimism and hope for progress, or as Henry George bluntly put it [8]:

> "Both jay-hawks and men eat chickens. The more jay-hawks
> the less chickens, but the more men the more chickens."

It has been seen that within this equilibrium-seeking process, there are implied a number of rules. These are derived from the "raw logic" of the Identity-Equations and the basic nature of Man (as an opportunity seeker, living within the limitation of the social system as defined by our model), that have been discussed in the paragraphs immediately above and in Chapter 9.

After equilibrium has been achieved, the overall results of the decision-making process are expressed in an output matrix of "influence-coefficients" as to be explained in Chapter 11. However, in order to present these ideas in a better way that is easy to understand, this next chapter first describes certain simplified numerical examples.

CHAPTER 11. THE CONSEQUENCES OF DECISION-MAKING ON EQUILIBRIUM

In this chapter, the subject of decision-making is continued to the final stage, that of explaining certain innate characteristics and their implications, which lie within our current method of envisaging the MESS. We start by presenting some numerical analysis, the results being obtained from four practical examples. The data for this exercise is assumed to apply to a modern style of macro-economy. We consider the results of various kinds of taxation, by the introduction of three additional and independent kinds of incremental flows. By examining the resulting stabilized multiplier-effects, now expressed in the form of influence-coefficients, it is possible to assess the sensitivity of the modified flows to these various disturbances and to compare these different national taxation policies.

In the following sections of this work, a description is given of a general method for appraising this decision-making, on the results of the overall equilibrium of the system. Subsequently it is shown how these terms are related to the decision-making ratios and an additional effect on system stability is mentioned.

11.1 Description of Four Practical Numerical Examples

At this stage in the analytic description of the working system, a digression is made by introducing some numerical examples. This is done with the aim of providing a better understanding, before continuing to explain the theory of operation of our macro-economic system in greater depth. Four examples are considered in a "thought-experiment", applied to an imaginary country, where the national financial situation is supposed to be of concern. Using numerical analyses, we examine this common macro-economic problem and some of its proposed solutions.

It is assumed that the main features of our chosen fictitious sovereign power are as listed at the beginning of Appendix D. The numerical values in Example 1 of this Appendix, represent the major money-flows, when this system is initially stable and in a state of equilibrium. The Identity Equations are first shown and the corresponding money-flow matrix provides a convenient means of illustrating the way that this style of MESS has evolved and developed.

It is further supposed that the government of this imaginary country now wishes to explore the ways that particular changes to the method of taxation might affect the future of its macro-economy. The exercise is to see how in turn, each modification influences the amount of macro-economic activity and to compare the subsequent rates of production and redistribution of the wealth. In our general terms, this is by considering the kind of equilibrium that is reached, after the introduction of a specific sized exogenous disturbance, at various locations on the matrix.

For convenience and ease in the manipulation of these numerical values, some simplified decision-making ratios are deliberately prescribed for use in the examples. They are listed after the money-flow matrices in Appendix D, for Examples 2, 3 and 4. These ratios have the effect of rapidly stabilizing the economy without the need to reiterate the results in the manner prescribed in the previous chapter. This simplifies the calculation, so the reader can follow it more easily, without the repeated time-cycles. Although the basic effects are similar to a full set of iterations, the various fractional increments are arranged to cancel out each other, but not before their influence has been given sufficient freedom of expression to be relevant. Consequently they reflect the change in system performance due to the particular kind of GOVERNMENTAL taxation policy and in one case to the HOUSE-HOLDER'S attitude to consumption and savings.

Example 1 comprises of the simplified basic MESS of our imaginary country. This community has a distribution of wealth and money that is typical of a "European/ Socialist" style of economy, (the meaning of which will become clear after examination of the list of assumptions and of the description of the particular system, given in Appendix D). In this example, equilibrium has been established after prior changes were included in the basic money-flows. This initial situation provides the starting-off stage, to which reference is made for the subsequent developments.

However, within this fictitious realm all is not well. It is anticipated that certain dynamics of the macro-economy (that lie outside our present field of study), will soon adversely affect the situation. The National Debt is very high (being typical of the Western style of national management) and with monopolies dominating industry, there is a high level of unemployment. Not wanting to cause inflation, any increase of GOVERNMENT income from the sale of new National Bonds has been kept relatively small. But the associated low rate of interest has not attracted much investment and the national economy is now entering a depressed condition, with large falls in share prices on the stock-market.

CONSEQUENTIAL MACROECONOMICS

The lobby for *free-enterprise* simply wants to reduce the amount of direct taxation of wages, in the belief that minimum of interference to producer/ entrepreneurs is the most beneficial policy. But the *Keynesians* contend that economic recovery should be induced by raising the demand for consumer goods, thereby increasing the money circulation. They would initiate this by a GOVERNMENT decision to spend more on public works. To provide for the resulting expenditure, this authority would first increase the amount of direct taxation. They claim that this money can then be used to create new jobs, which stimulate the system by "pump-priming" through the Keynesian Multiplier-Effect as expressed by R. Hicks in [14]. A third political group of *Georgists and environmentalists* contend that a more significant and lasting way to improve the situation is to reform the taxation as in reference [8]. Instead of increasing the income-tax, this forum would collect its revenue by the taxation of land-values, that is to say from the potential ground-rent.

We will examine all three of these proposals in this numerical study. The immediate effects on the macro-economy of making various changes to the tax regime and of the local and national response to it are considered in Examples 2, 3 and 4 that follow. The decision-making ratios in these examples are adjusted to fit the various circumstances.

In Example 2 the previous equilibrated economy is first modified along the lines of the free-enterprisers. This is done by reducing the amount of income-tax $\delta Tax = -\delta Th$, as a negative increment paid by the HOUSE-HOLDER. The smaller national budget that results, is balanced by the GOVERNMENT with its newly associated policy of decreased public expenditure $-\delta Cg$. The HOUSE-HOLDER entity substitutes for the gain in its income, by raising its personal consumption δCh (and spending more on luxury items), which increases its demand from the PRODUCER. However due to the diminished public-building programme, there is a reduction in the total production $-\delta GDP$ by this entity. Since the decision-making ratios favour the GOVERNMENT by 2 to 1 over the HOUSE-HOLDER, it has the effect of *lowering* of this entity's earnings by $-\delta Wp$. As a consequence there is a reduction in this entity's total income $-\delta Y$. The difference enables the HOUSE-HOLDER entity to carry the smaller burden of lowered tax-level and to enjoy the higher rate of consumption δCh, which actually comprises only half of its reduced taxes $-\delta Th$.

However due to the eased tax burden, there is *a reduction in the total amount of macro-economic activity* in the system*. One expression for this
_____
* see next page

is by the change in the total productivity **−δGDP**, which in this example has shrunk by half the increment of the newly reduced tax **−δTh** . However the overall (negative) change in the activity of the system comprises of increments only in the HOUSE-HOLDER and PRODUCER entities, whose total difference equals the tax change. When introduced into this macro-economy, the eased burden of income-tax benefits the HOUSE-HOLDER only, but it slows the total amount of productivity by the same amount. Thus the free-enterprise policy helps only a single part of the whole system and is unsatisfactory for the rest of it.

Had the tax been increased instead of reduced and the kind of response of the HOUSE-HOLDER been in the opposite direction to that above, then the effect of the increment of tax would equal the stimulation on overall production. However, in practice HOUSE-HOLDERS don't behave in this way, as is shown in the next example.

---

* This is not a "Paradox of Taxation", but simply the result of looking at the economy in the macro sense and disregarding the "personal micro" attitude, which in this case is effective in the opposite direction. This result is analogous to the explanation given by Richard Dawkins [44], where a lack of altruism is adverse for the whole population.

In Example 3 the income-tax is raised by a positive increment, as sometimes proposed by the Neo-Keynesians. In this case the HOUSE-HOLDER decides to substitute for the lost spending power by reducing its savings **−δS** but without diminishing its rate of consumption **Ch**. This attitude, which contrasts with the previous example (as described in Chapter 9.5c), results in a greater demand for the various kinds of produce **δGDP** than what occurred before. The PRODUCER gladly responds, by balancing this change against the use of more labour **δWp** and the hire of more durable capital goods **δHp** , both of which were held in reserve. However with less savings coming in, the FINANCE INSTITUTION has to substitute, by reducing its investment **−δI** (in durables). In this example the CAPITALIST can conveniently substitute for this reduced incoming money-flow with the increased hire-fees **δHp** for the greater use of its durable capital goods.

Due to the greater consumption and national investment (even with the loss of private savings), ***the total amount of economic activity has increased***, the increment in **δGDP** now being equal to the increment in tax **δTax = δTh**. This is double the magnitude of the response of Example 2. However when the whole system is included, the reduced participation of the FINANCE INSTITUTION **−δS** has the oppose effect on business activity. Including the

total changes from the PRODUCER, HOUSE-HOLDER and FINANCE INSTITUTION entities, it is apparent that the overall system responds with the same change activity per amount of disturbance, as occurred for the second example. This time, both the initial positive change and its effect are in the opposite directions than before.

In the longer-term, one might expect an increase to be made in the Prime-Rate on interest, due to the need to encourage and restore the greater amount of savings and investment that are needed to replace what presumably were the older durables. But initially the opposite policy is needed. (The alternative policy of the redemption of bonds δM by the GOVERNMENT is less attractive because it requires either more taxation or deliberate inflation of the currency by printing more money.)

This more-complex situation is probably closer to actual circumstances, when national attempts to reduce the effects of economic depressions have been previously made. The GOVERNMENT is a powerful influence here. Not wanting to cause the HOUSE-HOLDER to consume less, it will subsequently reduce the Prime Rate of interest. This applies a second kind of squeeze on the FINANCE-INSTITUTION. The CAPITALIST now makes smaller payments on mortgages and other loans, which reduces the sums flowing to the FINANCE-INSTITUTION. The CAPITALIST can now substitute for the reduced credit, by directly increasing its investment in new durable capital goods δCc without borrowing from the FINANCE INSTITUTION as described above. However, with less income the latter entity will feel the effects of the depression as a serious shortage of funds, along with the savings that are currently being withdrawn. Then bank failures are likely. The Keynesian approach of stimulating the system by "pump-priming" has failed to produce the desired effect, because the extra money used by the Government must be taken from another ailing part of the system.

In Example 4 we now examine the effect on national prosperity of the changed taxation structure as proposed by the Georgists and environment-alists. This is introduced by an increase in the land-value tax $\delta \textbf{Tax} = \delta \textbf{Tl}$ instead of that of the taxation of earnings δTh (in Example 3). The size of the increment is the same as before, with equal raised national budgetary income. However, it is the LAND-LORD who must now substitute, by passing less of his income $-\delta \textbf{Hl}$ to the CAPITALIST. This entity responds in two ways, by substituting with the call for greater amounts of investment $\delta \textbf{I}$ and by hiring out more from its reserve of durable capital goods. The effects of these two changes fall on the FINANCE INSTITUTION and PRODUCER respectively.

The former balances the added demand for investment δI , with the increased savings δS now happily coming from the HOUSE-HOLDER. And the latter (PRODUCER) balances it with the increased supply of consumer goods δCh as well as in response to the new public-building programme provided by δCg , as previously described.

These increased amounts of production and savings δS are now available, due to the HOUSE-HOLDER'S raised net income $\delta(Y - Th)$, which is derived from the improved labour demand, expressed through the wages increase δWp.

There is a greater increase in the amount of economic activity due to this change, than in Example 3, with the **GDP** increasing by one and a half times the tax change. The increment in wages δWp equals the tax increase and there is also an increase in savings of δS of half the tax increment. As previously noted, the greater amounts of positive balancing (due to this tax regime), have a larger beneficial effect on the degree of macro-economic activity compared to the substitution of the previous case. Without including the tax itself, the overall increase in this activity is now three times this increment and the amount generated in Example 3.

Compared to Example 1, the effect of the new tax structure is to improve the standard of living and to increase savings, whilst investment is redistributed (and initially reduced) and is made more of a FINANCE INSTITUTION responsibility. This act lessens the monopolistic control of the CAPITALISTS on investment in Example 1, (which Karl Marx [7] first described by his Theory of Surplus Value).

It should be noted that had the HOUSE-HOLDER decided to consume more of his additional earnings (and to save less) a different state of equilibrium would be obtained. The greater use of consumer goods would necessitate the PRODUCER hiring more capital durable goods. Less money would be saved for investment, but the return from the greater use of these durables results in the CAPITALIST getting the same income as before. This HOUSE-HOLDER savings decision depends on the rate of interest, whose adjustment now provides more autonomous-control of the investment through the FINANCE INSTITUTION, without any other entities being involved. This is a more natural situation than when the GOVERNMENT deliberately changes the Prime-Rate.

An important secondary effect is that there will now be a greater efficiency in the use of land, due to the influence of the collection of increased revenue (as

land-value tax) that its ownership entails. The parity between production and home consumption is now lifted, (which was constrained by the availability of resources, see Appendix E and Chapter 13). So both wages **Wp** and the consumption of commodities **Ch** can now grow dynamically during subsequent time-slices. To summarize the changed amounts of activity for these 3 examples:

Example Number	PRODUCER $\delta GDP/\delta Tax$	HOUSE-HOLDER $\delta Y/\delta Tax$	FINANCE-INSTITUTION $\delta FIC/\delta Tax$	TOTAL ACTIVITY OF THE SYSTEM* $\delta(GDP+Y+FIC)/\delta Tax$	BALANCE & SUBSTITUTE BAL.	SUBS.
2 Ø	½	½	0	1, negative, a loss	1	1
3	1	½	– ½	1, positive, a gain	2	2
4	1½	1	½	3, positive, a gain	4	2

TABLE 10 EFFECTS OF TAX INCREMENTS ON THE PROPORTION OF THE MACRO-ECONOMIC ACTIVITY, IN COMPARISON TO EXAMPLE 1.

* Only 4 entities develop increments.
Ø All the increments are negative, giving positive proportions.

Due to the deliberate simplification in the decision-making ratios (see above), the activities of the LAND-LORD and CAPITALIST entities are unaffected in these examples. The total amount of changed activity is reflected in the sum. This activity is not only in production, it covers all of the affected entities. The numbers of balancing and substitution actions are shown in the last two columns of this table. In keeping with the comment at the end of the previous chapter it is seen that there is an advantage when there are more balancing acts than substitutions. A more general expression of how the MESS accepts these changed activities is provided in the following section.

11.2 The Twelve Kinds of Influence-Coefficients

We can now consider the overall effect of introducing arbitrary small differences into the money-flows. Suppose that at any one of the 19 places on the matrix, a money-flow term is deliberately modified by an increment. These locations include the seven pre-set exogenous ones. In order to preserve the external equilibrium, the totals of particular rows and columns (or of Equations (1) to (6)) need to be corrected. This is done by the subsequent adjustment of the decision-related flow sub-increments on other terms of the matrix (see above), and iterating a number of times until the differences become sufficiently small as to be of no significance.

There are twelve places where these decision-making endogenous iterations result in specific modified values within the system. In the matrix below (Figure 5), these twelve increments are shown as well as their (six) row and column totals, each term carrying a "**d**" prefix to indicate that it is an added-on quantity. The totals show the modified amount of macro-economic activity as a proportion of the initial disturbance. Consequently they are an overall measure of the influence of each kind of change.

FIGURE 5. THE TWELVE INFLUENCE-COEFFICIENTS

ROW \COLUMN INPUTS\OUTPUTS	G	F	C	L	P	H	TOTALS
GOVERNMENT G	\	dM	[--]	[--]	[--]	[--]	dGNB
FINANCE INSTITUTION F	[--]	\	[--]			dS	dFIC
CAPITALIST C		dI	\	dHl	dHp	dHh	dCPL
LAND-LORD L				\	dRp	dRh	dLRN
PRODUCER P	dCg		dCc		\	dCh	dGDP
HOUSE-HOLDER H		[--]			Wp	\	dY
TOTALS	dGNB	dFIC	dCPL	dLRN	dGDP	dY	

By expressing the changes in this way, one obtains a set of ratios or non-dimensional coefficients, examples of which were shown in Table 10. In mathematical language, these constitute of partial differential-coefficients for use in the subsequent development of the macro-economy. These coefficients are a convenient measure of how the system is affected and they are given the name "influence-coefficients". Because they depend on the particular initial increments, their full set comprises of $(12 + 4)$ x $19 = 304$ numerical values. The extra 4 in the bracket are due to the HOUSE-HOLDER, whose unique response also depends on the signs of the output increments of this entity.

It is also apparent that the two kinds of expressions for economic progress:

Multiplying-Factor – 1 = Influence-Coefficient.

The influence-coefficients better express the scheduled (demand/supply) elasticities of the flows with regard to the particular increment.

The locations where the seven exogenous money-flows may be introduced in an incremental form are indicated by the square-brackets **[…]**, for comparison with Figure 4. It is the influence-coefficients, which are derived from these non-contractual terms that are of the most significant in the general analyses.

To summarize, the values of the equilibrated money-flows are not arbitrary. They are related by the behavioural properties of the entities within the flow-matrix. Specifically these properties are due to the topography of the system, its constraints, the signs of some of the increments and each entity's grouped decision-making ratios. The manner by which the money-flows are adjusted after a change is introduced, follows the rules given in Chapter 10. The redistribution eventually results in a set of influence-coefficients being generated, which are a measure of the overall sensitivity of the system to change.

11.3 Relationships Between the Decision-Making Ratios and the Influence-Coefficients

For a given set of decision-making ratios, the influence-coefficients are determinate and will not change. The relationship between them is the result of applying the process of iteration for equilibrium as described above. The values of the influence-coefficients are in fact a general expression of the ability of the particular system to find its new equilibrated situation. A relatively large coefficient means that the particular term has a greater influence on the stability of the MESS.

However, the subject of finding the coefficients is usually more complicated than the presentation given in the above examples, because of the variation with time of the limitations within the system. Due to these constraints and the variation of their combined influences with time, there is no general method of specifying how a response might eventually automatically result from a particular set of circumstances. On a practical level, the decision-making ratios are characteristic of particular entities in either their input or output aspects (or both). Their numerical values do not vary within the time-slice, but depending on the point where the incremental change is introduced (it may be at two places at once) the response of the system is different for each. The influence-coefficients are the results that summarize the final effects, after completely accounting for all of the ensuing changes to the flows.

11.4 System Stability Due to Self-Cancellation

A specific feature of the analysis has become apparent during the process of reaching equilibrium within the time-slice. This is the dual direction of movement over the matrix, of the incremental disturbances in money-flow. (This motion is in a slightly different sense to that of a money-flow itself.) The effect of the initial disturbance is felt in the two orthogonal directions associated with each entity. These effects are subsequently distributed over the locations on the matrix occupied by the money-flows. Hence we examine the process of finding equilibrium by going from one flow to another, not necessarily within a single entity, but according to a paradigm that is part of the decision-making process, within the matrix representation of the system as a whole.

From the numerical examples and rules that have been presented in this chapter, the process is seen to be one of spreading of successively smaller fractions of the money-flow increments. This reduction in magnitude by itself is a form of stability, because, as previously described, the size of the disturbance is progressively reduced whilst the Identity Equations equilibrate. However, it is also accompanied by some of the fractions mutually annihilating each other, due to the eventual meeting of their opposite strengths. In the simplified examples of Appendix D, this was deliberately arranged to quickly occur, but there is no assurance that this will generally happen so rapidly in practice. For actual distributions and decision-making ratios, the elimination of the disturbance by these two processes may require more than one iteration, after the smaller fractions of the first experienced increments have returned to their former locations on the matrix. (The various routes they use for this process have been described in Appendix F.)

When we encountered the concept of iteration in Chapter 7.4.5, it was used to show how the circular money-flow process could result in multipliers of some of the flows and to display their associated capacity to stabilize, from the effects of the disturbance. We can now qualify this concept with the knowledge that the influence-coefficients are the final results of the multipliers. They are greater than unity when positive balancing is performed within the circuit, less than unity when negative balancing is applied and are unaffected during the various substitutions. The limitations on the supply of certain production resources are also significant here.

It was seen that the concept of the multiplier-effect is stabilizing but that its effect is relatively small and ineffective. In the Keynesian analysis, this effect appears to be very significant. However, our model the application of the multiplier is more complicated than the Keynesian one. It has a second

means of reaching equilibrium, when the disturbances run in two directions and eventually eliminate each other. Both effects contribute in the process of quickly achieving the new state of equilibrium, whilst reducing the magnitude of the overall changes.

The matters described above are for short-term stability of the system. The classical theories of stability in other physical situations can also result in cyclic behaviour which is caused by either second-order dynamics (inertial effects) or large-scale non-linearity (in a single variable). The model used here does not contain these kinds of sophistication. Various first-order effects are all that are present and consequently it is unreasonable to expect the long-term macro-economic problems of business-cycles and their related dynamics to be properly covered. These matters are left for subsequent analytic work which is outside the scope of the present book.

CHAPTER 12. THE METHOD OF DETERMINING THE DECISION-MAKING RATIOS

Now that we have discussed the general manner by which equilibrium is established and maintained, it is possible to look more closely at certain aspects of how this is achieved. Of particular interest here is what determines the values of the decision-making ratios. This subject has been postponed, because we were dealing with the more basic quantities and their relationships, as expressed by the Identity Equations (1) to (6). Having examined their implications in the previous chapters, we can now describe in greater detail the way that the decision-making ratios are contrived. This involves the use of the second class of the equations, which were categorized as "technical" at the beginning of Chapter 3.

The fact that the decision-making ratios are determinate is implied by the various technicalities, which are inherent in the six entities. One aspect related to this, was previously expressed in Chapter 9 by summing the decision-making ratios in each block. In the same chapter, another aspect was the cross-over relationships derived from Figure 4 of Chapter 9.3. The solutions using these two kinds of equations have not yet found application. Additional technicalities are derived below, from the ability of each entity to govern autonomously without involving the rest of the system. The resulting Technical Equations play a supportive rather than a leading role, for which the Identity Equations have already been auditioned and cast in a matrix format. A fourth kind of relationship between the decision-makers is obtained as a later resort, using the incremental form of some of the Identity Equations, after a further differentiation (as was suggested in Chapter 7.3).

12.1 The Classes of Decision-Making Ratios and the Means for Their Derivation

It was previously mentioned that the properties of these technical quantities are not time-dependent, at least within the time-slices, and they apply endogenously there. The decisions are made using the six contractual decision-making blocks, see Figure 4 and Table 7. Three of them are output-demand related (in the columns) and three are input-supply related (in the rows). In Chapter 9 these output decision-making ratios are related through their sums (having the square bold brackets **[ ]**) in the PRODUCER entity Equation (13), in the HOUSE-HOLDER entity Equation (14) and the in FINANCE INSTITUTION entity Equation (15). Similarly, the input decision-making ratios are related through their sums (having the curly bold brackets

{ }) in the LAND-LORD entity Equation (9), in the PRODUCER entity Equation (10) and in the CAPITALIST entity Equation (11). Each of these six equations confirms the fact that the total of the decision-making ratios in its particular block must be unity.

The output payments are made in return for the diverse kinds of demanded produce, services and support. These distributions are described below, by introducing specialized "utility functions". In the opposite direction on the matrix, the spread of supplied goods, services and legal documents, results in the input money-flows being received by the entities. Unlike the previous situation, these decision ratios are derived from either the cross-over relationships as presented in Chapter 9.4, from the precedent that was set by the above output money-flows or from partially differentiating the Identity Equations with respect to their particular totals. Due to the nature of the various decision-making blocks of the entities, these functions and relationships are determined algebraically using the technical equations that follow.

12.2 The Utility and Production Functions (Money Outputs)

Consider first the micro-economic situation of a householder, who is planning to obtain the most desirable combination of consumer goods and services. The householder's situation is complicated by a need for many kinds of goods and services. Each has a different use, and his/her domestic desire is properly sated only by their use and enjoyment being spread over many products. (For example, to reduce hunger and thirst, both food and drink must be provided.) Over-indulgence in one kind leaves too little purchasing power for the others, which together can provide a more optimal degree of satisfaction. Therefore the householder must decide to compromise on the proportion of each item, which in concert will provide the greatest homely benefit.

The purchase and consumption of these goods and use of these services temporarily reduces the household's demand, because during their progressive use smaller degrees of satisfaction are achieved. Eating, for example, results in a loss of appetite, an effect that is generally described by T. Malthus [45] and known (with many others) as The Law of Diminishing Returns. This economic aim of obtaining the maximum aggregate satisfaction when using restricted means for its achievement always applies when buyers choose the best recipe of produce and opportunity rights. The combination of

the required goods and services may be expressed in an algebraic form called a "utility function", as described below.

A similar situation occurs when the three factors of production (as input) are being employed and used in a production process. The choice for the amount of each (demanded) factor is determined by the decision-making ratios. The way that these simultaneously apply is also according to a utility function, which is arranged to combine these factors in a way that results in the least production cost, rather than (as above) to provide the greatest satisfaction from consumption.

Specific utility functions can be applied for finding the best combination in the returning output money-flows, for the combined use of the different factors in production, in living expenses and possibly in investment too. We will first consider how to write the particular utility functions for the associated kinds of endogenous output decision-making blocks.

12.2.1 The Cobb-Douglas (Demand) Production Function

The best known of these utility functions is the Cobb-Douglas production function, see N. Mankiw, N. Gregory and P. Taylor [46]. It was originally devised for application to the micro-economic situation of a manufacturing plant. This mathematical function includes the combination of labour and capital investment that is taken by the PRODUCER in a production process. Let us consider the output expressed by this (technical) equation:

$$Q = Qc - Qp = a \times K^{\alpha} \times N^{(1-\alpha)} \qquad (22).$$

Where:

Q = net rate of production, in terms of the added value of the product per unit time, when Qc is the total rate, including that of Qp, the partly worked or "imported" materials. They are money-flows of the same kind as before,

a = a coefficient of productivity, which depends on the production factors and the scale of technical developments, for the combination of:

K = total (accumulated) value of capital investment required,

α = a non-dimensional utility index for the effective use of the capital. The value of α is positive and less than 1.0 , and

N = the number of equally skilled workers who perform the necessary labour.

In this expression, the dimensions (or units) of **K** and **N** are different. Their combined use under specific conditions in the Cobb-Douglas function along with **Q**, determines the value of the constant **a** . This coefficient is set to represent the rate of productivity, expressed in the form of a money-flow, which comes from the simultaneous application of the two factors. In this micro-economics case, **K** the total amount of capital might consist of different kinds, such as **K1** tools, **K2** buildings, **K3** technical skill, etc. (with the implication that **K = K1** x **K2** x **K3** x **…**). Their combined action in the process of production is by multiplication (rather than by addition), because each kind of **K** is essential for this type of production to take place.

When **K** and **N** are both altered in the same proportion, the output value of **Q** also changes by this ratio. This necessary result has been arranged in Equation (22) by the use of the index **(1 – α)** in the labour term **N** . This characteristic of the production process is known as "constant returns to scale". However, if an alteration is made to only one of these factors, it will result in a proportionally smaller change in **Q** , in the manner of the Law of Diminishing Returns described above. Thus, this form of the Cobb-Douglas Equation contains both of these kinds of relationships that actually occur between the contributory factors and the goods and services (resulting from the production process). In Figure 6 the curved lines are the various combinations of **K** and **N** that cause particular amounts of productivity **Q**. These **Q** curves are of an hyperbolic shape, having its radius of curvature away from the point of origin **0** of the axes.

FIGURE 6. THE PRODUCTION FUNCTION **Q** AND ITS COSTS
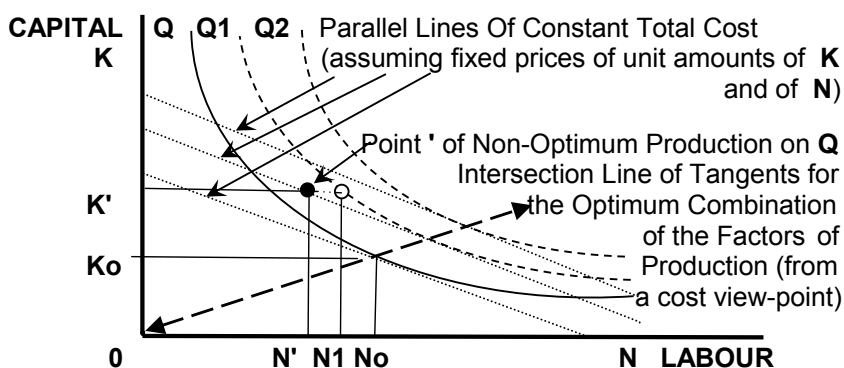
The Law of Diminishing Returns implies that there is an optimum combination of these two factors of production, when ideal quantities of **Ko** units of

capital and **No** units of labour are used. This combination results in the **t**he minimum total cost for a specific output of **Q** units of production. In Figure 6 the parallel sloping lines of constant cost are for various combination of these factors. By taking the cost line that lies tangential to the output curve, one can find this optimum and the ideal proportion of each factor used.

When the amounts of **K'** and **N'** are not in this proportion there will be an increase in the cost of the process. However, this non-optimum production has to be a long way from the ideal proportions before the additional costs become very significant.

When equilibrium is sought by substitution (see Chapter 10.2), close proximity to this ideal combination will not necessarily be maintained, because the entity is somewhat limited by the money-flow terms to which it can adjust. However during the balancing process, the entity has the opportunity to simultaneously modify the distribution between all the non-optimal money-flows, by making changes that are out of scale, so as to bring the proportions of the flows closer to the ideal combination. (In Figure 6, from a non-optimum position, an increase in output to **Q1** is achieved by using additional numbers of workers (**No – N1)**, without the use of any more capital goods **K**.) This form of biased decision-making was actually used in the simplified examples of Chapter 11, where a number of the ratios were deliberately set to equal zero. Consequently the examples are quite plausible. Due to a reluctance to change on the part of both the investors and the labour force, these kinds of adjustments may extend over many time-slices.

The subject of non-optimal decisions will be discussed after Equation (22) is modified for our three factors of macro-economic production.

12.2.2 The PRODUCER'S Macro-Economic Form of the Cobb-Douglas Equation

In the previous chapters, care has been taken to identify the differences between the productive effects of land-value and of durable capital goods. However, in Equation (22), the capital is not yet properly defined, because no distinction was made between the investment in the land and the amount put into capital durable goods. The equation can be modified for macro-economic applications by separating the value of the land (which is due the combined effects of the natural resources and the amount of development put into the region, see Appendix G), from the capital. We can think of these contributions to the production process as if they were additional technical factors, for outputs similar to the different kinds of capital **K1, K2** etc., as described above. Then:

$$Q = b \times Lp^{\beta} \times Kp^{(\alpha - \beta)} \times N^{(1 - \alpha)} \qquad (23).$$

Where:

$Q = Qc$ which now applies to the entire process of production, with $Qp = 0$

b = a different coefficient of productivity than a, now for the combination of:

Lp = the full value of the productive land, as determined by its saleable price and

Kp = the total value durable capital goods and knowledge needed for production.

β = a non-dimensional utility index for the effective use of the productive land, whose numerical value is positive and smaller than α. This is because Equation (23) is modified from Equation (22), where α applies to the value of the productive land and the durable capital goods, when taken together.

N and α are defined in the same way as before.

The same forms of production curves as before will result, except that they are now three-dimensional hyperboloids and that they intersect with planes of constant cost.

12.2.3 The Ideal-Cost Decision-Making Ratios Due to the Production
Function

The production functions also can be used to find the part-value of the produce that is attributable to each factor of production. These ideal-cost quantities express the relative worth to the PRODUCER of the various factors actually used. (However, they are not necessarily in the same proportions as when it returns the corresponding payment, see below.) The sizes of these ideal ratios are obtained by the mathematical process of partial differentiation of the output productivity Q, with respect to the particular factor involved. (The expression "partial differentiation" simply means that the other factors (of production in this case) are temporally assumed to be constant, whilst consideration is given only to the effect of making this single kind of change.) Then from Equation (23), differentiation with respect to the productive land-value Lp:

$$\partial Q / \partial Lp = b \times \beta \times Lp^{(\beta - 1)} \times Kp^{(\alpha - \beta)} \times N^{(1 - \alpha)} = \beta \times Q / Lp \qquad (24).$$

This ratio is called the marginal productivity of the land. As progressively more valuable land is used, its marginal productivity becomes smaller and its

cost of use greater. Then the proportionate money-flow that the PRODUCER finds worthwhile to return for its use, in other words the ideal ground-rent, is:

$$\textbf{\textit{Rp}} = \textbf{Lp} \times \partial\textbf{Q}/\partial\textbf{Lp} = \boldsymbol{\beta} \times \textbf{Q} \qquad\qquad (25a),$$

where the italics indicate the idealized quantities, here and below.

This is not necessarily the ground-rent **Rp** that the PRODUCER actually pays, because in the absence of perfect competition, the charge for the use of the land does not have to be compatible with its utility coefficient **β** . Another reason is that the substitutions themselves, as previously described, cannot keep these proportions fixed. This disparity results in a tendency for self-adjustment of the relative costs (at the point of tangency, such as in Figure 6) and the value of **β** , so that eventually they would correspond. But in practice, for the aggregate MESS, the relative costs are likely to change faster than indicated by these proportions of the production indices. This effect is also due to the influence of the cross-over terms in the LANDLORD's decision-making ratios, to be described later in this chapter.

By a similar analysis, the ideal hire-fees for the use of durable capital goods are: $\quad\textbf{\textit{Hp}} = \textbf{Kp} \times \partial\textbf{Q}/\partial\textbf{Kp} = (\boldsymbol{\alpha} - \boldsymbol{\beta}) \times \textbf{Q}\qquad\qquad(25b),$

and the ideal wages for the use of labour are :

$$\textbf{\textit{Wp}} = \textbf{N} \times \partial\textbf{Q}/\partial\textbf{N} = (1 - \boldsymbol{\alpha}) \times \textbf{Q} \qquad\qquad (25c).$$

Consequently the three returning parts (or ideal rewards) for use of the factors are:

$$\textbf{Lp} \times \partial\textbf{Q}/\partial\textbf{Lp} + \textbf{Kp} \times \partial\textbf{Q}/\partial\textbf{Kp} + \textbf{N} \times \partial\textbf{Q}/\partial\textbf{N} = \textbf{Q} \times (\boldsymbol{\beta} + (\boldsymbol{\alpha} - \boldsymbol{\beta}) + (1 - \boldsymbol{\alpha})) = \textbf{Q}$$
$$(26).$$

Each term on the left-hand side of Equation (26) consists of an expression from Equations (25a), (25b) and (25c), which comprises the worthwhile or ideal amount of returning money-flows for the use of the particular factor in production. This mathematical feature is due to the form of the Cobb-Douglas Equation, all of the three terms being positive. By including the tax **Tp** as an additional expense for the PRODUCER, **Q = GDP − Tp** from Equation (4), the ideal proportions of these three return costs are then:

$$\textbf{\textit{Rp}}/(\textbf{GDP} - \textbf{Tp}) = \boldsymbol{\beta}, \; \textbf{\textit{Hp}}/(\textbf{GDP} - \textbf{Tp}) = (\boldsymbol{\alpha} - \boldsymbol{\beta}), \; \textbf{\textit{Wp}}/(\textbf{GDP} - \textbf{Tp}) = (1 - \boldsymbol{\alpha}) \; (27).$$

Now consider the effect of introducing a change to the productivity $\partial Q = (\partial GDP - \partial Tp)$, for the purpose of determining how the returning fractions should be modified. This is obtained by partially differentiating the first part of Equation (27) with respect to **Q** and equating it to zero, so as to find the minimum rate of change of the variable:

$$(\partial Rp/\partial Q)/Q - Rp/Q^2 = 0 \quad \text{or} \quad \partial Rp/\partial Q = Rp/Q = \beta \qquad (28a)$$

and similarly: $\quad \partial Hp/\partial Q = Hp/Q = \alpha - \beta \qquad\qquad\qquad (28b)$

and: $\qquad\qquad \partial Wp/\partial Q = Wp/Q = 1 - \alpha \qquad\qquad\qquad (28c)$.

Unfortunately, due to some of the terms being ideal values (in italics), these equations are not sufficiently practical for use in solving for the actual decision-making ratios. Nevertheless, referring back to the definitions of these ratios in Chapter 9.4, and to Equation (13), when the idealized and actual increments are taken to be the same:

$$[\delta Rp] = \partial Rp/(\partial GDP - \partial TP) \quad \text{or} \quad [\delta Rp] = \partial Rp/\partial Q = \beta \qquad (29a),$$

similarly: $\quad [\delta Hp] = \partial Hp/\partial Q = \alpha - \beta \qquad\qquad\qquad (29b)$

and: $\qquad [\delta Wp] = \partial Wp/\partial Q = 1 - \alpha \qquad\qquad\qquad (29c)$.

It is seen that these equations automatically satisfy Equation (13). Consequently, for ideal-cost decision-making in our system, both the proportionate returns and the decision-making ratios are equal to the utility indices of the modified Cobb-Douglas Equation (23) of the PRODUCER entity. At this stage, each decision-making ratio term is positive in sign.

12.2.4 The Non-Ideal Decision-Making Ratios

The theoretical values of the decision-making ratios in Equations (29a), (29b) and (29c), are with the assumption that the proportion of each money-flow is equal or close to its ideal (least costly) value. However, in practice this happy condition does not necessarily prevail and in response to an incremental change, it may be preferable to set the ratios according to a modified criterion. Such a criterion should be based on both the ideal proportions, as given above, and on the previous time-slice decisions as related to the actual amounts of money flowing. The following general expressions provide the means of finding the values of these more realistic but non-ideal decision-

making ratios, (which are from the output of the PRODUCER, using the modified Cobb-Douglas Equation).

The procedure used here is to find the differences between actual and ideal money- flows, and then to divide them by the increment ∂Q . These three results are then subtracted from the ideal decision-making ratios of Equations (29a), (29b) and (29c), respectively.

Thus: **β** becomes **β – (Rp – *Rp*)/∂Q** ,

        (α – β) becomes **(α – β) – (Hp – *Hp*)/∂Q**

And: **(1 – α)** becomes **(1 – α) – (Wp – *Wp*)/∂Q** .

As a consequence Equations (29a) , (29b) and (29c) are replaced with:

$$\textbf{Tot} \times [\delta \textbf{Rp}] \ = \ \textbf{β – (Rp – } \textit{Rp}\textbf{)/∂Q} \qquad\qquad (30a),$$

$$\textbf{Tot} \times [\delta \textbf{Hp}] \ = \ \textbf{(α – β) – (Hp – } \textit{Hp}\textbf{)/∂Q} \qquad\qquad (30b),$$

$$\text{and:} \quad \textbf{Tot} \times [\delta \textbf{Wp}] \ = \ \textbf{(1 – α) – (Wp – } \textit{Wp}\textbf{)/∂Q} \qquad\qquad (30c),$$
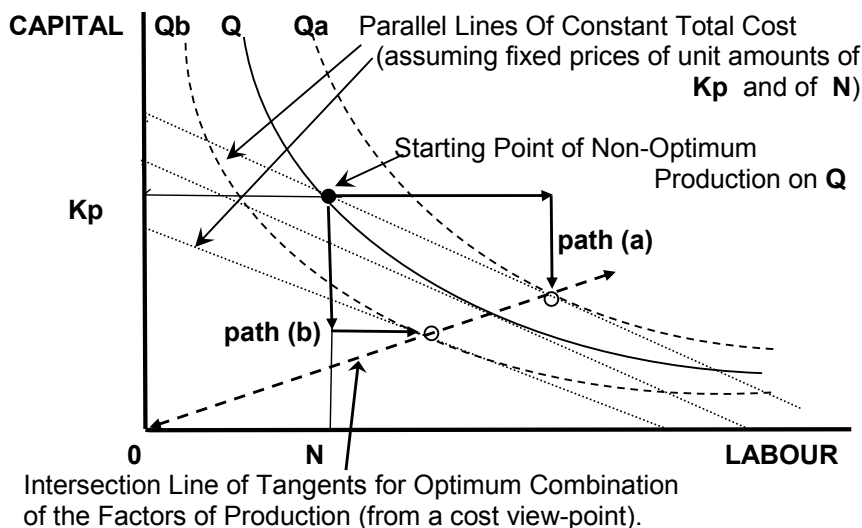
where **Tot** is deliberately set to equal the total of all the terms on the right-hand sides of these three equations, thereby ensuring that Equation (13) is still true. The decision-making ratios now may be of either sign and greater or smaller than unity.

These ratios are thus also seen to depend on the sign of the increment ∂Q, as well as on the magnitudes and signs of the three differences. Even if one or more of these terms is negative, the total must still equal unity, after the other terms have been adjusted to comply. This means that at least one of the decision-making ratios is positive, and it applies when two or more money-flows are being considered.

Figure 7 below, shows the situation for a combination of two of these variables in the production function and their returning money-flows, (such as those in Equation (22)).

FIGURE 7. THE EFFECT OF MAKING TWO INCREMENTAL CHANGES TO THE PRODUCTION FUNCTION **Q**

Intersection Line of Tangents for Optimum Combination of the Factors of Production (from a cost view-point).

By this graphical expression, after including the production increment, the non-ideal decision-making ratios bring the variables and their actual money-flows closer to the line of the tangents, which corresponds to their ideal (optimum) values. Two procedures are shown above, that start from the same non-ideal point on **Q**.

Case (a) is for a positive increment in ∂**Q** = **Qa – Q** and case (b) is when it is negative for ∂**Q** = **Qb – Q** .

The signs of the decision-making ratios in case (a) are positive in the Labour **N** direction but negative in the Capital **Kp** direction. These two components may be taken in either order. For case (b) the two changed components are of different magnitudes than before. Due to the reduction in productivity, ∂**Q** is negative. After division by it, the sign of the **Kp** decision-making ratio becomes positive and for the **N** ratio it becomes negative. It is now clear that when a negative decision-making ratio is required, the values of the positive ones compensate, so that the total equals unity. This also applies when using more than two variables, as in the situation that leads to Equation (23).

Although these details may appear to be complex, the ideas behind them are quite simple. It is emphasized that this aspect of finding the decision-making ratios is a very real part of the whole process of obtaining equilibrium. When the non-ideal ratios are modified, the iterations will need progressively smaller adjustments. Then it is possible (though not essential) that the ideal ratios will be reached with a sufficiently small tolerance before proper equilibrium is attained.

12.3 The Other Two Entities Having (Money Output) Demand Decision-Making Ratios

In common with the PRODUCER, both the HOUSE-HOLDER and the FINANCE INSTUTION are candidate entities for their output demand utility-functions of the money-flows to be formulated in similar ways. Figure 4 in Chapter 9.3, illustrates where they fit into the system. It is seen that the HOUSE-HOLDER has four decision-making ratios and the FINANCE INSTITUTION has but two. Some of these ratios are derived from the associated utility functions, by the same method as presented above. These particular functions are expressed in algebraic formula having different Greek and Latin letters in their notation (see later), but they adopt the same format as previously applied to the PRODUCER entity, each term corresponding to one decision-making ratio.

It might be thought that these special functions deploy only in the circumstances when some sort of utility is released from the factor (during the time of its employment), **without any significant change occurring in its inherent value**. For the PRODUCER, it was indeed the case when the factors were land-value, labour and durable capital goods. This characteristic of utility functions is now applied to the expenditure on ground-rents, hire-fees and investments (bonds or shares). The valuable savings and share certificates from lending and investment resemble the durable capital goods. They are not consumed, whilst generating their returning interest and dividends. In a similar manner to the returns from the factors of production, these are regarded as opportunistic utilization benefits. But in the case of consumer goods they are absorbed by the entity involved and therefore the above (underlined) claim is not sufficiently general to apply to this utility function. It is better to think in more general terms of the consumption of the potential opportunity for use, even when this advantage is not directly taken.

Below are presented certain aspects of these two additional utility functions. However, there is no need for us to repeat the full algebraic analysis. Instead, certain explanations and details are presented with less mathematical

emphasis. They concern how these particular entities autonomously respond, with regard to the proportions of their endogenous decision-making ratios.

12.3.1 The HOUSE-HOLDER'S Utility Function

In the case of the HOUSE-HOLDER, the output money-flows that arise from its diverse demands may be identified from Figure 4. These rates are: the consumer goods for which money **Ch** is spent, access to (or lease of) the land for which ground-rent **Rp** is conveyed, use of residences and other durable capital goods for which hire-fees **Hh** are remitted, and the possession of new savings certificates for which credit **S** is extended (and on which interest is later received). In a similar manner to the derivation of the production function, the proportional changes in flow-values of these various demanded items are also determined by a utility-function.

The acquisition of these commodities and rights provides for their three different kinds of consumption (and enjoyment) by this entity. In common with the production process, all of them are necessary and the associated decision-making ratios depend on the relative degree of satisfaction, as expected and normally obtained from the use of each, when the other two are present. Not surprisingly, the consumption of goods, the right of access to residential land and use of houses (that are built on part of that land), are regularly "used up" by an actual home-maker. So a continuous expenditure by the aggregate HOUSE-HOLDER is needed to renew them, and the form that they take within the utility-function is similar to that for the PRODUCER. (As previously noted, the actual home-maker who owns the property behaves as a HOUSE-HOLDER, a LAND-LORD and as a CAPITALIST, with some of these money-flows being transferred internally, even without the individual necessarily being aware of it!)

However in the case of the savings **S** , the desire for them arises because the HOUSE-HOLDER entity sensibly prefers to put into reserve some of its income. These savings will be withdrawn when the other sources fail or when there is a need to meet an increased demand. This anticipates that the alternatives of receiving subsidies from the GOVERNMENT will not necessarily suffice, nor that the subsequent borrowing be attractive, due to its higher cost. Consequently, these savings decisions are motivated by the willingness of the HOUSE-HOLDER to defer some spending power, rather than from anticipating a larger amount of interest.

Except for pension-funding (which is made obligatory for some of the working- population), the aggregate motivation to save is comparatively weak.

Further, this activity does not comply with the nature of the other three essential utilities, so it adds to the function rather than multiplying it, see Table 11 at the end of this chapter. This combination of the utility factors admits that fluctuations in the average income of this entity can greatly influence the amount saved. In the Examples 2 and 3 of Chapter 11, this fickle nature of the savings decision was illustrated, during the investigation of the effects of positive or negative increments of income tax.

The steady natural rate at which the HOUSE-HOLDER acquires and uses the potential from the three kinds of desirable goods and rights, results in their decision-ratios laying close to their ideal values. But this does not apply to savings, which may even change sign to become "dis-savings" when there is a high proportion of retirees, whose current livelihood depends on accumulated earnings (with interest) from the working parts of their lives. Thus the eugenic (and exogenic) behaviour of the population provides the explanation here, because what at present is being saved may not correspond to what currently needs to be withdrawn.

12.3.2 The FINANCE INSTITUTION'S Utility Function

Concerning the FINANCE INSTITUTION, the two output demand money-flows are for bonds to cover the sums M loaned to the GOVERNMENT, and for share certificates to cover the amounts I invested with the CAPITALIST. These two utilities add directly, see Table 11. The relative attractiveness of acquiring each of these kinds of paper credits depends both on the rate of return being offered for the use of the money and on the degree of risk involved. The central or National Bank being part of the FINANCE INSTITUTION, buys National Bonds thereby lending money at almost no risk to the GOVERNMENT which returns interest on the loan. (This interest eventually comes from the tax payer, as a service charge on the credit that comprises the National Debt.)

This rate of return that is pre-set on new bonds, competes directly with the aggregate rate that the CAPITALIST entity currently pays out as dividends on shares. This entity finds the money for these payments, from the yield obtained by prior investment in durable capital goods gainfully used in a production process. When the GOVERNMENT decides to increase the National Deficit, the National Bank will raise the Prime-Rate of interest for new bonds. It may be increased even above the current average rate obtainable from investment in the shares of publicly owned companies offered on the stock-exchange, but this depends on the comparative risk, see Chapter 15.1.3. (This action provides the GOVERNMENT with additional income and spending power after it has collected insufficient from taxation but

still wants to increase the amount of subsidies or handouts or to raise the national expenditure in public works etc. In the opposite situation, when the GOVERNMENT decides not to renew the bonds, the total amount of money increases, eventually becoming available for investment by the CAPITALIST, both kinds of actions being benign.)

In determining the decision-ratios, these two kinds of "paper demands" vary together, because they have the ability to meet different investment needs that are compatible to the ideal amounts of change from previous cycles. Due to the crossed-over decision-making term from the CAPITALIST'S block, the value of this ratio is also determined by supply considerations. The quantity of the new shares being offered is decided by this entity. It is anticipated that their prospects and dividends will attract sufficient money-flow and that these shares will hold or improve their established places and prices in the subsequent stock-trading for second-hand share-certificates.

Variations in these interest rates for these new shares $\mathbf{I}$ and for new bonds $\mathbf{M}$, are likely to be in the same direction according to the changing equilibrium rate due to the supply of and the demand for money (see Chapter 14). But within the FINANCE INSTITUTION entity, the proportions of these flows are very sensitive to small differences in the rates of return and the greater degree of security that the bonds offer. Consequently the concept of utility functions is of little significance here, compared to the competition for investment, by suitable adjustment of the size of the interest rates. This affects the decision-making ratios and their relative behaviour, where the situation is more psychological rather than ideal.

12.4 The Input (Supply) Utility Distributions

The output money-flow decision-making, as explained above, is the compromised distribution of the demand for goods, services and valuable legal documents. Unlike that class of decision-makers, the blocks of input money-flows that are considered in this section have a different basis for their choice. The relative amounts of these money-flow inputs, for the supply of the various commodities and documents used in our macro-economic activities, are partly the results of the earlier decision-making with respect to their demands. However, the supply of these articles and credits are more strongly dependent on their availability and on their comparative price, as described in Chapter 9.2a), being the criterion for what is most worthwhile to supply.

Referring to Figure 4 and to Equations (9) to (11) in Chapter 9, it is seen that the three entities involved in the supply distributions are the LAND-LORD, PRODUCER and CAPITALIST. Associated with these entities there are six cross-over money-flow terms that were derived and explained in that part of the analysis, see Equations (16) to (21), which have not yet been used to find the values of any of the decision-making ratios. Together with the above-mentioned three equations, sufficient information appears to be available for the determination of all 9 unknown ratios. However, as will be shown below, some of these equations cannot be applied so directly. Although the autonomous nature of the entities scarcely warrants attention here, there is a need to introduce additional relationships between certain of the associated incremental money- flows. Consequently, in order to determine particular decision-makers, we need to include the differential forms of some of the Identity Equations. As in the case of the previous descriptions of the various decision-making blocks, we will consider each of them separately.

12.4.1 Decision-Making Due to the Supply of Access to the Land

The LAND-LORD permits the availability of this natural resource (when the entity is not holding it out of use for purposes of speculation in its value, see Appendix G). There are two money-flow terms for the supply of these rights, which are made available to the HOUSE-HOLDER and PRODUCER entities. However, both of them are cross-over terms, being determined by Equations (16) and (17) respectively. Also these two decision-making terms equal unity in sum, according to Equation (9). Consequently there is a surplus of information and the only way for it to be properly absorbed is for part of it to "feed-back" into the non-optimal output decision-making ratios of the two entities, which were already covered in section 12.3.

Substituting Equations (16) and (17) into ∂**LRN** times Equation (9), results in:

$$(\partial\textbf{GDP} – \partial\textbf{Tp}) \times [\delta\textbf{Rp}] + (\partial\textbf{Y} – \partial\textbf{Th}) \times [\delta\textbf{Rh}] = \partial\textbf{LRN} \tag{31}.$$

This expresses the fact that since we know that the sum of the input decision ratios **{…}** equals one, then due to their relationships through the cross-over terms, we can determine their connection with the output ratios **[…]**. This formula suggests that as more land becomes available for use (or as its value increases), the additional ground-rent ∂**LRN** (synonymous with the extent of land-value utilization), will be taken-up by the PRODUCER and HOUSE-HOLDER entities together. Then these greater amounts are in proportion to the relative change in productivity ∂**GDP** or earnings ∂**Y** respectively, after the tax changes ∂**Tp** and ∂**Th** have been deducted from each. If for example,

there were no changes in the amount of production or its associated purchase (or value-added) tax, then all of the additional land-value would be taken for residential usage. However, it is more likely that a rise in the population would cause an increase in both **GDP** and **Y** of roughly equal amounts and therefore that the distribution of the additional land utilization would correspond.

In effect this result provides us with an algebraically redundant criterion for determining the proportions of the demand (output money-flow) terms within these two entities. However, since they are able to adopt non-optimal values of certain decision-making ratios, the LAND-LORD'S influence on the comparative demand for the use of the land is related to their outputs. Then we need to go back and modify some of the output decision-making ratios. Expressed in terms of the process for finding equilibrium, this complication results in an additional level of iteration. It also means that as it now stands, due to the positions of these data in the matrix, there are insufficient equations to directly find the remaining input money-flow decision-making ratios in the other two input blocks.

12.4.2 The Decision-Making Ratios Due to the CAPITALIST'S Money
Supply

Examination of Figure 4 shows that there are four decision-making terms in this block, three of which are on cross-over locations. In Equation (11) their sum equals one and consequently it might be thought that the fourth term is immediately determinate. In practice the situation is not as simple as this and an additional equation is required.

Suppose that during an equilibrium-seeking iteration, there is a change to the amount of property tax paid by the CAPITALIST to the GOVERNMENT entity. Then the CAPITALIST will need to redistribute the supply of the services that it provides. Two of the decisions about hire-fees that this entity collects (for **Hp** and **Hh**) are already determined by their cross-over terms, and the income money-flow from the LAND-LORD **HI** is also independent of the CAPITALIST'S control. All that this entity can do in the way of supply adjustment is to modify the amount of new shares for investment $\partial\mathbf{I}$ that it decides to issue. From Equation (11):

$$\{\delta\mathbf{I}\} = 1 - (\{\delta\mathbf{Hp}\} + \{\delta\mathbf{Hh}\} + \{\delta\mathbf{HI}\})$$

On the right-hand side of this equation, the first two curly-bracketed terms are the cross-over ones from Equations (19) and (21). The third term is defined in

terms of the increments of the CAPITALIST entity, in Chapter 9.4. Now multiply both sides of the definition of **{δHI}** by ∂**CPL**:

$$\{\delta HI\} \times \partial CPL = \partial HI = (\partial LRN - \partial TI) \tag{32},$$

where the last substitution is due to the identification of the output money-flow increments in the LAND-LORD entity. (In Table 7 there are 6 of these terms, having non-cross-over properties, three of them apply to the input flows being examined here.) Then substituting Equation (32) and both cross-over terms into the above-modified form of Equation (11) yields:

$$\{\delta I\} = 1 - ((\partial GDP - \partial Tp) \times [\delta Hp] + (\partial Y - \partial Th) \times [\delta Hh] + (\partial LRN - \partial TI)/\partial CPL)$$
$$\tag{33}.$$

Within the decision-making block of the CAPITALIST entity, the only ratio that is not known is **{δI}** and by using Equation (33), this quantity now can be found.

In Figure 4 we see that the decision-maker **{δI}** is also a cross-over term on the block of demands from the FINANCE INSTITUTION as in Equation (20). Its effect (rather like that described above in the case of the LAND-LORD) is to feed-back, so as to modify the other decision making-term in the FINANCE INSTITUTION'S demand block. This complication is similar to the LAND-LORD'S output money-flows, described above.

12.4.3 The Supply Decision-Making Ratios of the PRODUCER

Referring to Figure 4, it is seen that only one of the terms in the supply (horizontal) decision-making block is from crossing-over. The other two terms are independent and for these ratios there is insufficient information. The two feed-back effects described above, have absorbed data that otherwise might have been available.

The only way that the PRODUCER can supply the needs of both the GOVERNMENT and CAPITALIST entities is to accept that their demands are compatible with the competitive prices that each offered in the previous time-slice. This does not always work, when GOVERNMENT demands are not open to bargaining and must be met first. However, due to the large quantities of produce that are involved it may be possible for the CAPITALIST to negotiate investment changes for durable capital goods needed for this production, due to GOVERNMENT control of the other financial aspects. The total quantity of the produce is limited by one of the factors of production (see

Chapter 16 and Appendix F), but its distribution is affected by the asking prices that are being paid. In common with the other feed-back situations described above, the kind of adjustment that applies here requires an additional level of iteration for solution. The CAPITALIST'S demand for durable goods **Cc** is strongly affected by the operation of the system. In combination with the decision about **Cg**, it will influence the way that the macro-economy develops. Plans extending beyond one time-slice may apply, when large-scale public works require a big investment in durable capital goods. These will need to be prepared at the start of a multi-year programme. Thus before **Cg** expands **Cc** may need to be increased and the decision-making here can be part of the general exogenous plan.

12.5 Summary of the Determination of the Decision-Making Ratios

The two classes of decision-making ratios are summarized in the following tables:

TABLE 11a. DETERMINATION OF THE 9 OUTPUT DECISION-MAKING RATIOS (in the blocked-in columns of Figure 4.)				
			CRITERIA	
RATIO	ENTITY BLOCK (EQUATION)	FROM UTILITY FUNCTION	IDEAL VALUE	METHOD OF DECISION-MAKING*
[δRp]	PRODUCER (13)	$GDP - Tp = b \times Lp^{\beta}$ $\times Kp^{(\alpha - \beta)} \times N^{(1 - \alpha)}$	β	Non-Ideal Production, see § 12.2.4
[δHp]			$A - \beta$	
[δWp]			$1 - \alpha$	
[δHh]	HOUSE-HOLDER (14)	$Y - Th =$ $c \times Hh^{\eta} \times Rh^{(\gamma - \eta)}$ $\times Wp^{(1 - \gamma)} + S$	η	Non-Ideal Consumption, see § 12.3.1
[δRh]			$\gamma - \eta$	
[δCh]			$1 - \gamma$	
[δS]			----	Savings Motivated
[δM]	FINANCE INSTITU-TION (15)	$FIC - rs\sum(S) = M + I$	----	Competition for Investment see § 12.3.2.
[δI]			----	

*For these output flows, the decision-making ratios are found using the utility functions and their non-ideal improvisations only.

RATIO	ENTITY BLOCK (EQUATION)	FROM CROSS-OVER LOCATION (IF ONE EXISTS), OF BY EQUATION ( ), AS GIVEN IN CHAPTER 9.4	ALTERNATIVE DECISION-MAKING (EQUATION)
		TABLE 11b. DETERMINATION OF THE 9 INPUT DECISION-MAKING RATIOS (in the blocked-in rows of Figure 4.)	
$\{\delta Rp\}$	LAND-LORD (9)	$\{\delta Rp\} = (\partial GDP - \partial Tp) \times [\delta Rp] / \partial LR$ (16)	"Redundant Feed-back" (31)
$\{\delta Rh\}$		$\{\delta Rh\} = (\partial Y - \partial Th) \times [\delta Rh] / \partial LRN$ (17)	
$\{\delta Cg\}$	PROD-UCER (10)	$\{\delta Cg\}$ By exogenous GOVERNMENT decision.	
$\{\delta Ch\}$		$\{\delta Ch\} = (\partial Y - \partial Th) \times [\delta Ch] / \partial GDP$ (18)	Competitive Price
$\{\delta Cc\}$		$\{\delta Cc\} = 1 - (\{\delta Cg\} + \{\delta Ch\})$ (10)	
$\{\delta HI\}$	CAPIT-ALIST (11)	$\{\delta HI\} = 1 - (\{\delta Hp\} + \{\delta Hh\} + \{\delta I\})$ (11)	Acceptance
$\{\delta Hp\}$		$\{\delta Hp\} = (\partial GDP - \partial Tp) \times [\delta Hp] / \partial CPL$ (19)	"Redundant Feed-back" (33)
$\{\delta Hh\}$		$\{\delta Hh\} = (\partial Y - \partial Th) \times [\delta Hh] / \partial CPL$ (21)	
$\{\delta I\}$		$\{\delta I\} = (\partial FIC - \partial rs\sum(S)) \times [\delta I] / \partial LRN$ (20)	

In the case of these input flows, the decision-making ratios are found using the cross-over terms and the differential form of the Identity Equations. Where none occurs and in the absence of a monopoly (which is not always the case), it is either by the competitive price or by a feed-back process having both precedent and competitive bases.

Whilst trying to provide a theoretical basis for finding these ratios, there exists some doubt about whether practical considerations should be included. The most obvious, simple and linear approach is to take the ratios on a block in the same proportions as the current flow-rates that were established at the end of the previous time-slice. However, from our better understanding of the differential coefficients, the values will not merely continue in this linear manner and the above analysis is an attempt to show that the redistribution of the increments of money-flow are not solely dependent on the topology of the system (which applies for linear cases only), even though this may prove to be the most significant effect.

CONSEQUENTIAL MACROECONOMICS

PART 5. MONEY

Rationalizing About How Our Social System Works

CHAPTER 13. THE THEORY OF MONEY AND RUDEMENTARY BANKING

Having presented a logical and comprehensive model and explanation for the general equilibrium of the macroeconomics system, our image of its basic structure still contains a number of loose ends. This chapter and the three that follow, deal with many of these matters. Although they appear to be ancillary to the main-stream of thought, the subjects examined here arise directly from the basic model. As such these matters should not be neglected--their aspects are still very relevant to the way the system operates. Their study forms an intermediate stage of analysis between the present approach, with its emphasis on short-term quasi-static effects, and the dynamic aspects of growth and change over longer time-periods. (The details of this concept were conveniently avoided in the previous analysis, by the adoption of exogenous jumps between the time-slices).

13.1 The Differences Between Wealth and Money-Values and Where They Act

Different kinds of money-flow values were shown in Figure 1, not all being wealth. Wealth is the general expression for the value of only the tangible material output of this production, namely goods. Wealth is created by the prior exertion of labour and the return payments of wages **Wp** along with ground-rents **Rp** and hire-fees for the use of durables (or the alternative dividends) **Hp**, all being retained in the value of the goods, until they either become obsolete or are consumed. When goods become damaged or ineffective in serving their purpose, their value is reduced or lost. In the case of the durable capital goods, their values partly depend on the wealth of the physical qualities stored within them (resulting from prior labour) but also their value is due to their potential capacity for being useful. The other kinds of valuable produce, namely services and legal documents are not regarded as wealth because they are intangible.

The money-value of the goods is not their inherent wealth, but merely ***the means for its measurement***. In the earlier chapters this is how the money appears, where it flows in the opposite direction to that of the wealth of the physical items (and the value of the services provided, etc). The value of the money itself is due to and controlled by its scarcity for use in our society and this is described below. Thus wealth and money-value are different concepts. After production has ceased, the inherent wealth of the product is unaffected

by its short-time storage. But when money is put aside, all it does is ***to represent the wealth*** on which it subsequently will be spent. Therefore unlike produce, the stored money has value without it being wealth. This concept is useful when discussing money matters within economics, although less discretion prevails elsewhere. (The exception is when the money takes the form of a trading-object such as gold, which simultaneously exists as wealth too.)

There are two kinds of money-flows which are related to the creation of wealth, but without the need for any resulting produce. These are the ground-rents **Rp** for the right of access to land, and the hire-fees **Hp** for the availability of durable capital goods. Consequently they flow even when nothing is being made, since they measure the time-dependent opportunity costs, for the potential utility of the land and of the durable capital, respectively. When goods are produced, the returning costs of using these two factors of production become part of the total value of the product and are they included in its cost. But these potential money-flows also can be wasted or diluted and their worth spread more thinly, to include the periods when production is postponed or diminished to less than full capacity.

The value contained in a newly available natural resource such as land, is due only to the labour put into discovering it and developing the means for its access and use. When considering it as a natural resource, its value is unchanged (or even partly reduced) by the work done on it from prior use. However, its subsequent and growing value also depends on the surrounding population-density, see Appendix G. When ground-rent arises for the access rights to land, it derives from the proximity of the community and from the development of the region. (The owner of a vacant site in a populated district is said to be wealthy, but this is a colloquialism. By definition, the land itself does not constitute wealth, since it was not man-made.) Then unlike durable capital, the land-value is of a potential type of value alone. These relationships are illustrated in Figure 8 on the next page.

To explain the theory of money and its use, we will review its hypothetical development within society and the different attitudes taken to it. At increasing levels of complexity, various forms of money (all having a common feature) have been progressively introduced. Within our macro-system, one can follow these money developments and examine some of their microeconomics aspects too.

FIGURE 8. RELATIONSHIPS BETWEEN WEALTH AND MONEY-VALUE
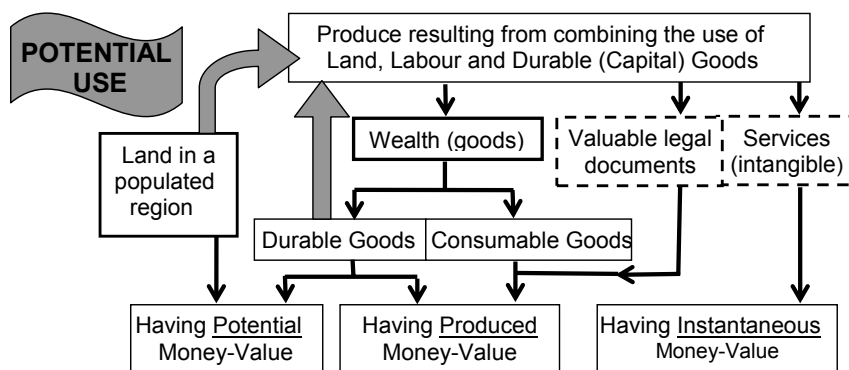
13.2 Theory of Barter, Super-Barter and Simple Banking

13.2.1 From Barter to Promises (Before Money Existed)

In an undeveloped community, there are few kinds of produce and they are grown or made by comparatively crude and simple means. Instead of everyone's effort resulting in the same range of goods, each member finds it more efficient when he/she specializes in one particular kind of product. However, when directly put to use, these individual types of home-made provisions give their consumers diminishing amounts of satisfaction. The members of the society naturally wish to enjoy a wider variety of produce, so trading between neighbours occurs and barter becomes a significant feature of their emerging community. With the system of barter however, not every trade-item has the same appeal and the different quantities of goods being exchanged do not have an equivalent usefulness to everyone. Nor do these various items necessarily take the same effort to produce. Thus barter can be frustrating; the valuation of the produce being indefinite and it being unclear why one kind of traded goods is more desirable compared to another.

Three or more traders who are offering various kinds of attractive produce (not all of which is desired by the same person) can arrange for a series of exchanges around a table. Due to their pre-determined order, each participant receives produce that provides greater personal use (or value) than what he/she is willing to forego. This circular-barter can be expedited by means of a common trading-object of similar utility-value to all, which passes between these aspiring merchants in the opposite direction to the goods

(eventually to return to its origin). Different trading-objects can be used to indicate the roughly average value of the various quantities or kinds of goods being offered by each party within the separate rounds of these social exchanges, thereby easing some of the frustration described above.

The trading-objects soon develop commonly accepted values and they find use in paired exchanges too. The first party to each deal needs to check the trading-object for value, which may have decreased with time. But after a while, experience with these objects results in their standardization as the currency for the frequent exchange of wealth. They may take the form of arrow-heads, storage-pots, decorative shells or coins made from precious metals, the defrauding of which is subsequently prohibited by newly enacted money laws.

As well as using trading-objects having wealth, business in the developing towns becomes easier when formal promises are made for the supply of particular goods items. Suppliers, whose goods are known to be of consistent quality, give written commitments to provide specific quantities of their merchandize by certain dates. Whilst not constituting wealth, these pledges perform a function that is akin to it. Thus these "super-barter" promissory-notes replace some of the alternative (heavier or less convenient) wealth-currencies previously in common use. Also the effort put into making the trading-objects (in the form of actual goods) is no longer necessary. This macro-economic advantage is not obvious to the owner, whose myopic purpose is merely to have suitable items for exchange and not solely for direct use. However, with the use of promissory-notes, the exchanges take place as before, but the action is easier due to the need to check only the validity of the signature. For large contracts it may be further eased, by the endorsement-stamp of a goldsmith (for a fee, when acting as an "acceptance-house") which guarantees the return-value being usually expressed in terms of gold.

Another advantage of using the post-dated promissory-notes is the appearance of greater amounts of trade, since many of the exchanges occur before the buyer's goods or services are ready for return to the seller, or even before production has commenced. Because they are contracts for future goods, the trading activity progresses more rapidly than were the subsequent exchanges made by barter alone. Consequently the growth in the total value of the promises, anticipates the higher rate of production and consumption. Depending on the degree of trust within the community, the merchant-traders can reasonably expect the notes to return to their signatories and be redeemed for the specified goods by the pre-set dates. Thus the value of these paper promises is created by the confidence placed in them. It is

apparent that the value residing in the trading-objects is transformed from "wealth-money" into time-limited "promissory-money".

The next stage towards banking is when "discount-houses" are introduced (note, this term has a different meaning today.) They provide wealth-money (of a reduced value) in exchange for the promissory-notes, ahead of their redemption dates. Here promissory-notes of equivalent value are cleared (or extinguished) by direct exchange (e.g. a commitment of 20 hunting-knives for an assurance of 200 rabbit-skins) without any actual goods being involved, nor is the need for their promises for production actually to be honoured. Therefore money has been created as a replacement for some of the trading-objects. This kind of business may include the whole community, provided their notes are trustworthy and redeemable. The service is better provided after the traders begin to use a specific form of the note, which is regarded as common currency. Unlike barter, when two or more prospective buyers bid for the same item, the offer of standardized promissory-notes with additional small denomination coins or other objects, enables the seller to choose the customer who willingly trades at the greatest competitive market-value.

13.2.2 Money and Simple Banking

To encourage trade without there being doubt in the truth or timing of the promises, the growing communities arrange for their discount-houses to centrally manage all the local finances. Each prints a limited number of its paper money notes, thereby adopting a banking role. Each bank-note carries on its face a serial number and the value of the trading-objects that it represents, such as a standard weight of silver. Unlike the promissory-notes, these bank-notes are not restricted in their return date and they replace the various different trading-objects at fixed prices. These objects may include gold (which has similar problems in the confirmation of its quality and quantity, as do all the other items). To allow small-scale deals to be made, some of the notes that the bank releases are for fractional amounts of the chosen unit of value and the bank may issue low denomination coins too. Initially the worthy bankers radiate assurance about the ease of re-purchase of these valuables, which are securely stored. Each is not permitted to add to his spending power by secretly printing money for himself or for a friend, nor may any non-banker print it.

Soon the various banks of the localities all adopt a common form of money, having specific values of their trading units, in the form of easily-carried but hard to copy bank-notes. These notes circulate freely within the greater community. Trading is now according to the exchange-value of particular

quantities of wealth, it being determined by the face-values printed on the notes. Coins find use for small sums. This technique for payment replaces the less convenient trading-objects, which retain their value but not their social function. Money can now be paid-out as wages **Wp**, ground-rents **Rh** and **Rp**, for the hire of durable capital goods **Hp** and for the total costs and market-prices of the produce **Ch** and **Cc**. This money model of the macro-economy is now consistent with the defined functions of the LANDLORD, HOUSE-HOLDER and PRODUCER entities, but some of the idealized activities of the GOVERNMENT, CAPITALIST, and FINANCE INSTITUTION are missing.

13.2.3 The Micro-Economic Competition for the Exchange of Goods

With the introduction of money into the community, the sum used for purchase of a specific quantity (and quality) of merchandize, is not necessarily fixed. An exchange between a supplier and his customer is affected by the agreed sales-price of the goods. After the sale is contracted, a similar goods activity in progress by another pair of merchants may settle at a different price. Consequently the sellers find themselves competing for custom by price adjustment.

Generally, the lower-priced goods sell in larger quantities, whilst the higher-priced ones go to a smaller number of clientele, for whom the value of money has less serious implications. The shopping policy of the thrifty more-patient buyers is to show little interest in the merchandize, thereby "encouraging" the prices to fall due to the competitive pressure to sell. In contrast, the action of the more aggressive sellers is to "promote" a rise in the prices by emphasizing the high quality and scarcity of their wares. They may even try to monopolize their product's distribution and sale. This duality of action is the same micro-economic expression of human nature that was previously described, it being understood in business that everyone naturally aims at obtaining the greatest benefit from making the least effort.

Form the seller's viewpoint, the agreed price equals or exceeds his/her evaluation of the production cost of the goods, including that of their carriage and sale. However, the buyer sees this same price as being less than or equal to his estimate of their value, due to both his/her shopping efforts and the use to which the merchandize will be put. This comparison of values often results in a price-range, inside which both parties can trade. Neither discloses the actual value of the goods to him or her, although during bargaining each insists that his/her offer is the best affordable.

Consequently, this exacting nature of monetary transactions introduces a degree of realism into trading that was missing before the money era. The

average value of each kind of goods becomes clear and it influences the resulting commerce. Money is sometimes blamed for this inherent characteristic of facilitating better business.

At this level of operation, the banks are working at the lowest degree of complexity. The money is used for three purposes only - as a convenient medium of exchange (to replace barter and its doubtful estimates of worth), for temporary storage and for reckoning the value of the traded merchandise at standard rates and uniform average prices. The notes that the bankers distribute are directly negotiable for the trading-objects. When gold coin is also used, the specific value of the paper money confirms to the "gold-standard" at the particular bank from where it was issued.

13.3 Implications of the Use of Money in Simple Banking

Before considering the next stage of development in banking-money functions, we now examine what is implied by the use of paper money.

13.3.1 Record-Keeping, Credit and Money Circulation

The introduction of individual banking-accounts enables both money and trading-objects to be left at the bank for safe-keeping. The trusty banker keeps accurate records for his clients and at periodic intervals he gives them formal statements of their current-accounts, based on the cash, notes and other valuables that have crossed his counters. Although these records are separate from the money, they have the power to replace it. Clients having regular accounts can now pay a third party by the use of written instructions to the banker, who transfers the money directly to the recipient's account without doing more than accurately changing some of the numbers in his accounting-lists. Thus business between members of the community can be transacted without having to exchange bank-notes, due to the understanding and use of genuine credit-transfers, passing between the various clients through their banks. The reliable exchanges of payment instructions between different banks for the same kind of money, subsequently allow inter-town trading to proceed without the fear of money being stolen in transit. A tri-partite transaction is the result, good communications being essential with the bank as the third party.

In practice these pledges are handled every day in the form of the instant-acting debit cards, shopping-vouchers or credit-notes, by post-dated cheques and by the credit-cards in popular use. This short-term credit is provided by

specialized "pre-money" dealers, who are independent of the banks but must work closely with them. The biggest total sums involved are from earnings, large amounts of which are rapidly cleared through purchasing. This total is continuously changing, but its amount is indefinite due to the speed with which the credit returns, whilst more is extended (and the remainder becomes short-term overdrafts).

Unlike bank-notes, these forms of credit must carry the clearance date of their eventual exchange for currency or other specified valuables. Therefore, these credits are actually temporary money, since they are initiated by their exchange for goods etc., whilst their coverage by the banks is specifically delayed. Because these kinds of credits are continuously being given and received, they are a secondary form of money, their quantities being virtually independent of the banks. However, they are under causal supervision by the Government, which may limit the maximum amount of individual debt.

The total rate of money-exchange within the macroeconomics system is according to the magnitude of its **GDP** and the other exchanges between the entities, see Chapter 14.1.4. This activity quickens by means of barter, trading-objects, coins, promissory-notes, bank-notes, cheques, credit-cards, etc. Then the role of bank-notes, which substitute for the valuable trading-objects, itself is partly superseded and the total flow of money in use does not depend on the banks nor on the Government, although this agency often assumes the responsibility for minting the coins and printing the bank-notes.

Consequently the total trading activity is basically that of super-barter, which uses a delayed-value monetary transfer-system for most of the payments and with a limited proportion of the exchange media being in direct-acting currency. The claim by the monetary economists, such as I. Fisher [43], of a specific velocity of money-circulation which relates to the total face-value of the currency issued (even with bank accounts included), is artificial and imprecise. This anomaly is better explained in Chapter 14. However, it implies that the banks could easily manage to extend credit, without its value having to be covered by goods-items or trading-objects.

13.3.2 The Bank Operating Costs

The banks perform a useful bookkeeping-service to the community, which takes personal effort and it also involves use of the two other factors of production. In order to cover the associated costs, each bank charges its clients for the services it performs. Thus the bank not only handles these operations on behalf of the customers, it also does business with them. Within our macroeconomics model this action is part of the services provided

by the PRODUCER entity and is not only performed through the FINANCE INSTITUTION.

13.3.3 The Gold-Standard

At an intermediate stage in many countries' developing systems of macroeconomics, both gold and silver are exchanged in the convenient form of coins, which are also money. Then banks issue their notes at nationally agreed exchange-rates for these precious metals, but inevitably gold becomes the ultimate trading-object. It is soon found that not all the gold needs to be kept locally. The Government instructs the National Bank to buy it from the local ones, by issuing them with receipts, which retain their value as Treasury-Bills. Then the gold is delivered to the central National Bank for "safe-keeping" highway robbers permitting.

After supplying the banks with the negotiable bills in exchange for gold, the Government can use this collected wealth for international business such as foreign investment and trade. When the parties to these transactions behave in an honest way, full trust remains in both the banks and the Government. No damage to the macro-economy results, providing that the "gold-standard" of the currency is maintained, with relatively small quantities of the precious metals being locally redeemed (and occasionally sold back).

However, the price of gold can depend on both its demand and supply, due to other external causes. In war-times, civilians who are escaping as refugees pay more for gold than during the peace. On the other hand, the discovery of new deposits of gold or silver, results in lower prices being offered for them. Safeguards need to be introduced to stop these metals from cheapening too much. (This situation occurred during the "gold-rushes" in California, USA, and in Victoria, Australia, when gold-dust was used as money.) Confidence in the value of gold is usually high. Although the value of the more-generally used bank-notes no longer should be regarded as absolute, fluctuating gold prices can sometimes cause the paper currency to be treated as the standard for the measure of wealth, also see Chapter 14.2.2.

In fact the gold standard no longer applies to our currency today and the nature of money has undergone this and a number of additional changes. The simple kind of banking, as described above, has become more complex-- it now incorporates some supplementary and profound complicating features.

13.3.4 Savings and Loans

Banking activities go beyond replacing gold by bank-notes for use in trading. The banks are also useful as money stores. When the rate of earnings of a household exceeds that needed for regular expenditure, it is expedient to put some of the income aside as savings, for use when conditions are less benign, such as at a time of sickness, old-age or drought. The savings may also be more happily spent on home-improvement or for holidays. The local bank gladly provides this savings-service, by safely storing the money and by issuing (redeemable) savings-certificates to document it. Like the gold, this money is kept in the bank vault and in common with gold not all of it needs to remain there. Consequently the bank finds itself able to advance credit by lending money. This apparently innocuous added activity of money, introduces the more serious effects to be described below.

13.4 The Bank as a Creditor

The labour invested by native craftsmen in making spears for use by the tribal hunters, gives no assurance that their probable return will be accompanied by fresh meat. Similarly, when gold was first loaned-out for a suitable reward, its anticipated return also carried an attendant risk. In general there are doubts concerning the motive, ability or reliability of a borrower to return the loan within the specified time. In these unwelcome circumstances, the banks anticipate the possibility for a delay or loss in the return of the credit and even for bankruptcy. Consequently the banks include in their interest an insurance allowance, to protect themselves against these mishaps. In order to further reduce these kinds of failures, the banks cover themselves in a number of ways that depend on the social status of the would-be borrower and the size and duration of the anticipated loan, which is advanced only after this client agrees to certain constraints, which may include:

a)   A delayed right of access to the current accounts of the borrower. This is similar to the use of credit-cards and it applies to small scale loans only.

b)   The right to liquidate collateral belonging to the borrower, in the form of certain valuable goods or legal documents, such as long-term savings certificates. These guarantee the loan repayment. If the client fails to pay back the loan in time, the bank sells the goods or redeems the certificates and thereby recovers its money.

c)   When the collateral is real-estate, the loan is provided after mortgaging the property so as to legally restrict its sale. The loan is returned in

regular payments that are spread over many years. Should they cease, after a specified number of times the bank can regain much of its credit by selling the property. This is usually at a loss, since the money is often urgently needed. The client looses the property, along with a part of the investment. By paying additional premiums, certain insurers will guarantee the mortgage returns, provided that the failure was from a loss of private income, due to sudden unemployment, accident, long-term sickness, natural disaster, etc. Thus better investment security is provided, but it is done by the equivalent of payment of interest at a greater rate.

d) Various speculative kinds of collateral are also occasionally used, combined with insurance to reduce the risk. These may be anticipated as being in partly-grown produce by the farmers, in likely prospects for oil or mineral deposits by the business concerns, by stealthily withholding land parcels for subsequent growth after developments of the city infrastructure are being planned or in partnership with Governmental agencies for the establishment of better communications and/or transport systems.

Although the local bank extends credit in these ways, by law or more recently by custom, it is obliged to keep in its vault a specific proportion of the savings-deposits, and the bank must be careful not to allow its reserves to drop below this level. This is because there may be a sudden series of calls on the bank for cash withdrawal--a likely action at the start of an economic depression, before the consumers begin to reduce their spending. This subject will be elaborated in the following chapter.

The rate of interest set by the bank on the loan, usually exceeds the costs of the service being provided plus any cover for the risk being taken. Even when the collateral is easily liquidated, interest is still charged. These extra sums necessarily substitute for the alternative dividend rates obtainable from share-holdings, had the money been invested in business concerns, or for the Prime-Rate of interest going to Bond-holders of Governmental loans. It also covers the rate of inflation.

Due to the extraordinary power of credit to command rates of interest in this way, the banker's role becomes more involved and influential than that for the simple kind of banking previously described. The banks take-on various additional functions and consequently the macro-economic activities involving money are more extensive and need a new chapter for providing a satisfactory and full explanation.

CHAPTER 14. HOW THE BANKS EXTEND CREDIT FOR
INTEREST

Before examining the relationship between the banks and the GOVERNMENT (which also spreads into the following two chapters), it is useful to describe some aspects of money lending and its circulation between the banks and their clients. This follows logically from the prior simple banking situation. These matters are not isolated from the whole MESS and they need introduction here, there being a significant number of effects that make the bankers' participation more complicated.

14.1 Activities Due to the Commercial Value of Money

Due to the common principle of a saver's rights to receive interest on loans, money itself becomes marketable. The banks within the FINANCIAL INSTITION entity are able to collect the savings and then to extend the credit. These activities naturally influence both the HOUSE-HOLDER and the CAPITALIST entities, which provide and absorb these assets respectively. The GOVERNMENT is also involved, as shown here and in Chapter 15. These activities are no longer presented on a microeconomics scale--they are better envisaged as being aggregate functions within the whole monetary system and they involve the flow-rates of money-transfer.

14.1.1 The HOUSE-HOLDER'S Attitude to Having Cash-in-Hand (and
the Money Supply)

Once the current taxes are paid and liabilities returned, the HOUSE-HOLDER can immediately decide on how to use any asset remaining from its income. By keeping a current account in the bank, the risk of theft is eliminated from this uncommitted personal money. The decision to save part of it for a specified time in a deposit account will provide in addition some returning interest. With this awareness, the individual householder determines the amount of the remaining money to be used for savings at the bank (or if owing, to be returned), see Chapter 12.3.1.

Since a householder usually spends most or all of his/her regular income, any bonus earnings may tempt this consumer to purchase more goods (thereby raising the quality of home-living), rather than to save the additional sum. In contrast, a drop in regular income may prompt this client to withdraw some savings rather than to accept a lower living-standard, unless the real rate of interest (with an allowance for loss due to inflation, etc.) is unusually high.

CONSEQUENTIAL MACROECONOMICS

Within a stable macro-economy, the amount of savings being regularly withdrawn roughly equals the sum being periodically saved. Then, with these personal savings, the use of the money by the HOUSE-HOLDER as an entity is deferred and not abandoned.

Some of the consumers find it impossible to save and they may prefer to live in a continuous state of debt. These householders buy goods on credit, whilst simultaneously returning what was owed from their previous expenditure. They find that the early acquisition and use of the more-basic kinds of goods with an interest payment being returned is the best that they can manage. Such poorly run households often prefer to hire their living-spaces from a property owner, rather than follow the more traditional and stable form of home-ownership with the repayment of its mortgage being spread over many years.

The savings choice also depends on the rate of inflation or deflation of the National Currency. During times of inflation, prices are continuously rising, so the initial response of the HOUSE-HOLDER entity is to spend money quickly (and if possible, to borrow some too), in order to stockpile merchandize before much spending-power is lost. This temporally increases the demand for goods (and money). Only when the rate of interest exceeds that of inflation, can the savings yield a "real" return that encourages their growth (or a speedy repayment of their debts). On the other hand, with the falling prices of a deflating economy, the HOUSE-HOLDER retains its income (or delays returning any credit) for as long as possible, aiming to pay the least amount for goods by buying them only at the last moment. This initially discourages the demand for produce or any willingness to supply loans. The current interest rates are low, due to the diminished need for investment in durable capital goods for use in any new production. Then it is a logical national policy to reduce the Prime-Rate in order to encourage spending and to ease the cost of being in debt.

Some banks provide deposit (savings) accounts that enable the client to compromise in this choice. This is in addition to the regular current accounts which do not give interest. These banks take advantage of the house-holder's uncertainty, by offering comparatively low rates of interest on the amount deposited, depending on its size and duration. By gathering together these smaller sums, the banks then use the total to obtain a higher rate of interest, when they re-invest in National Bonds or in other reliable kinds of equities. Thus the act of personal saving is also one of investment. By this method the banks and other savings-fund societies cover the smaller interest that they return by the greater dividends obtainable from subsequent business.

Generally, all saving for investment originates from the sums supplied by those who are willing to forego their present purchasing-power and to accept the interest at the rate being offered. This response can be expressed as a supply characteristic curve, which shows the variation of the sum that would be newly saved **+S** (without including the part simultaneously being redeemed **-S**) verses **rs** the yearly rate of interest returned for it. As this rate increases, so does the average hypothetical rate of money-flow that savers willingly supply. This in turn depends on the total personal income which is proportional to the rate of production or the annual **GDP**. When expressed in this way instead of directly in terms of savings, (by J.R. Hicks [14] who followed and developed the theory of J.M. Keynes [42]), this relationship is known as the **LM** (Liquidity of Money) or the savings supply-characteristic, see Figure 9 below. When the macro-economy is contracting or expanding, the increment in savings **S** is only partly influenced by the rate of interest being returned and the whole **LM** supply characteristic curve independently moves up or down. Also the influence of compulsive spenders or savers is related. In Figure 9 (below) this is seen as dependent on the amount of growth too.

14.1.2 The Banker's Attitude to Attracting Investments (and the Money Demand)

There is also a parallel drive coming from the CAPITALIST entity, to continuously monitor and optimize the investment of any loan so obtained. This double-sided action greatly affects the activities of the local banks. Nobody wants to retain money any longer than necessary, including these parts of the FINANCE INSTITUTION entity. Then the money that has been recently saved immediately provides for some long-term mortgage loans, for investment in shares relating to commerce and industry and for the purchase of "gilt-edged" Bonds offered by the GOVERNMENT. Figure 4 shows that the FINANCE INSTITUTION continuously faces these kinds of decisions in performing its particular kind of balancing-act. In practice certain specialized banks deal with personal savings and mortgages. Different banks supply loans or secure their investments in insurance companies or other finance-related commerce. These investments arise from new savings and temporary allocations from the National Bank—as in emergencies, it acts as "the lender of the last resort".

The rates of interest that are returned to these various creditors are not exactly the same. These rates depend on the nature of the loan or investment and on the subsequent use of the money. However they are all related to the Prime-Rate **r** , as set by the National Bank or Treasury on behalf of the

GOVERNMENT for attracting new credit by the issue of its bonds and in which alternative the particular bank also may prefer to invest, as described in Chapter 12.3.2. Unlike borrowings, this kind of investment in public-company shares is not time-limited, although the yield is returned regularly to its source by means of the stock-exchange (see Chapter 15). When industry is doing badly and the dividends are comparatively small, the reduced amount of interest paid for borrowing will encourage the demand for loans. But during prosperous times when high rates of interest prevail, the practicality of demanding credit is slowed due to the greater sums paid for taking this advantage. This nature of this call for money is in the form of a borrowing curve. When the flow-rate of money is expressed in terms of the **GDP** (as explained above), the result is the **IS** (Investment Savings) or money-demand characteristic, also shown in Figure 9. The influence of an expanding or contracting degree of prosperity in the macro-economic system causes the position of this curve to rise and fall as a whole.

14.1.3 The Supply of and Demand for Money

Individual micro-economic effects, as described in the previous two sections, give points on the supply and demand curves as shown typically in Figure 9, whilst the aggregate macro-economic effects apply over smaller ranges of variation within these curves. Along with the aggregate sums in the savings-contracts and like any other supply function, the availability of money directly depends on its "price". This relationship is expressed as varying linearly with the rate of interest. Similarly, like any other demand function, the need for money is inversely proportional to this rate.

According to J.R. Hicks [14], the two curves intersect when the supply of and demand for money become equal. This applies whether the amounts are expressed directly as new savings **+S** or as withdrawn sums **-S** being presented relative to the **GDP**, according to Figure 9 on the next page. Then the rate of interest is stable, the intersections of the curves indicating the rate and the quantity of money involved. Between time-slices the conditions change and these two characteristic curves become altered. They may be for example, due to increasing prosperity, when both curves move according to the grey arrows in Figure 9 . After economic growth occurs between points A and B, the rate of interest is slightly less here, whilst the flow-rate of money in use is significantly greater.

FIGURE 9. THE SUPPLY AND DEMAND CHARACTERISTICS OF MONEY

Flow-Rate of Money, Expressed as a Part of the **GDP**
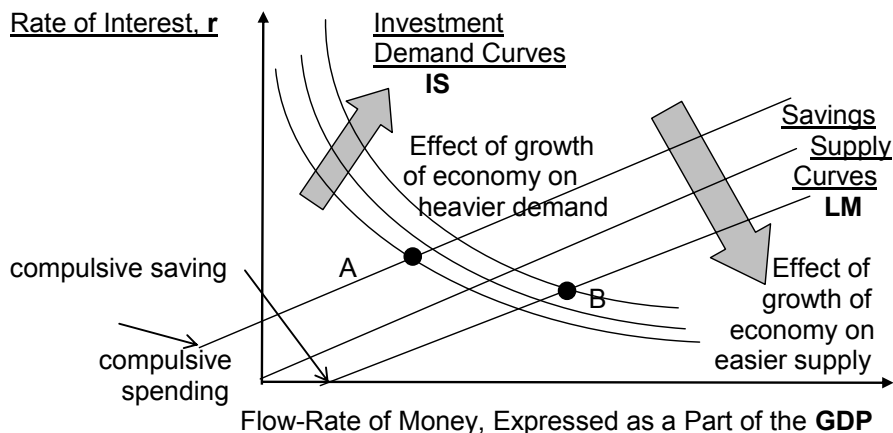
Other detailed micro-economic relationships concerning the comparative prices of goods and services do not need explanations, because they do not affect the general macro-economic equilibrium. However, for our macroeconomics model this money relationship has relevance, since it deals with the determination of the average rate of interest of the whole system. As described above, these two functions influence the money-flows only between the HOUSE-HOLDER entity and the FINANCE INSTITUTION, but within the big picture savings and investment are unequal in size. All the terms of Equation (6) are involved, not just the savings **S** relationship between these two entities. The effects of investment I and the redemption/re-issue of National Bonds **M** are also relevant. The slightly different rates of interest of all three accumulations should be included properly.

Thus the commonly described **LM/IS** method of obtaining "general equilibrium" (as presented for example in W.H. Branston and J.M. Litvak [39] and many similar Keynesian macroeconomics texts), does not adequately represent the true situation. The intersection point of the curves in Figure 9 is not the sole criterion for determining the interest rate (although the Hicksian method [14] is suitable for the two other kinds of investment too, in durable capital I and in bonds **M** , when they are positive). Instead, for an active macro-economy (that is not necessarily being influenced by inflationary or deflationary pressures), the rates of interest are best found by using Equation (7). This includes the iterations for equilibrium previously described for the "big picture", being useful for determining the amounts saved or invested and their rates of interest **rs** and **ri** respectively. Money is continuously being

withdrawn as well as saved, and this also applies to the investments and bonds. Exogenous changes between the time-slices are used to cover this effect.

Therefore, as was shown in Chapters 8 to 11, the correct method for obtaining the general equilibrium of the whole system during a time-slice is by the simultaneous balancing and substitution technique of all 19 state-variables. It is noted that in Equation (7), the Prime-Rate of interest **r** (set by the National Bank), is normally slightly more than for direct savings. This enables the commercial banks to cover some of their operating costs, to avoid bankruptcies and to justifiably return dividends to their shareholders in the form of interest, since the services which the bank provides are a form of business activity too.

14.1.4 The Effect of the Interest Rate on the Rate of Circulation of Money

If money and credit could be transferred instantaneously and personal incomes were known before being earned (and immediately paid after the labour was performed), then only a small quantity of circulating bank-notes would suffice. In fact, the use of credit-cards to cover short-term deficits, goes some way towards achieving this ideal (see next section), but in practice both consumers and small-scale businessmen find it convenient to keep certain sums readily available. From their viewpoints, the quantity of money being held varies inversely with the current average rate of interest, so that greater sums go with lower rates. However in more general macro-economic terms, when there is more business activity this greater prosperity is associated with high rates of interest. Then there is a rise in the speed at which the money changes hands, together with the greater frequency of return to the bank of sums of a particular size. But when trading is slack, the rate of interest is low. Then larger sums are kept aside, since there is less impetus to either invest these sums or to urgency spend them and the visits to the banks occur less often.

Consequently, although the rates of production and interest tend to vary together, the total money in circulation fluctuates to a far smaller degree. Regardless of the degree of macro-economic activity, on average over a specific period of time, people tend to keep in-hand roughly the same sums. (Possible exceptions are due to the transient responses of the HOUSE-HOLDER, as described in the previous section. Over a long-term, expansion in the size of the population and growth in the macro-economic scale also will affect the rates of money circulation, see section 14.2.2). Incidentally, a similar situation applies to short-term loans. When business is vigorous, credit

is extended (and returned) over a short duration. But, during quieter times when less money changes hands, the aggregate use of loans is not diminished. It is only that they are retained for longer intervals.

In many macroeconomics texts, the rate of money circulation is expressed in algebraic terms as:

$$\textbf{Mon} \times \textbf{V} = \textbf{SUM} = \textbf{p} \times \textbf{N} \qquad (34),$$

see I. Fisher [43] and M. Friedman [47].

Where:

    Mon is the amount of money in circulation, currency plus short-term promises

      V is the velocity of this circulation, or the reciprocal of the number of times per time-slice that **Mon** is repeated,

    SUM = **LRN** + **GNB** + **Y** + **GDP** + **CPL** + **FIC** which is the circulation rate of the total money, in the whole system (of Figure 1) including temporary sums, see Chapter 7.6, since all of the entities (and equations) are involved and

      N is the theoretical number of items (including services etc.) at average price **p** that are traded over the time-slice.

However, it is apparent that this synthetic expression, Equation (34), has no further practical use. The difficulty with the terms on the left-hand side is the rapid variation of the quantity of money in circulation. If salaries are paid more frequently, less total money is required. Due to this effect, the average of the total number of cycles (or velocity of money **V**) experienced during the many exchanges within the time-slice, becomes impossible to determine. Also the sums due to newly loaned (and returned) money and the amounts in temporary use as credit etc., are complications that make its total indeterminate. Even comparative money velocities are hard to find, unless it is only the actual currency in use which is being examined. In fact the **SUM** involves considerably more than this, due to the greater rate of money-circulation as created through the banks and/by the use of temporary promissory documents.

14.2 The Implications of the Bank Acting as a Lending Institution

14.2.1 The Consequences of Crediting

Assets that are saved in the bank (at a rate of interest) are usually placed in a deposit account. By law or custom (more commonly applied these days), a small proportion of them must be stored in the vaults of the bank against a sudden demand for cash, whilst the rest is available for the bank to lend out again (at a slightly higher rate). This common practice of lending from deposited sums which are based on most of the savings, is called "fractional reserve accounting". When banks took in trading objects and gold, they issued bank-notes which then circulated through the monetary system. Some of this currency subsequently returned to the bank as savings. It then was available for re-loan. Consequently, an earner (within the HOUSE-HOLDER entity) who left some gold or money in his/her deposit account instead of spending it, favoured the bank with more than merely providing it with the means for taking the one-time interest. The money could be used to create interest on a multiplicity of occasions.

Today in a growing macro-economy, when the GOVERNMENT releases fresh currency into the system, the resulting new savings for investment also have an enhanced influence, due to this multiplier-effect. Similarly to the Keynesian Multiplier [42] (which returns decreasing amounts of consumer money on each cycle), this savings effect continuously adds to the investments, with the total being progressively approached. When all the banks function together as the FINANCE INSTITUTION entity, much of their savings deposits are re-loaned as credits, which continuously return. Then most of the initial savings from the new currency can re-cycle through the system. Money has not been created, but due to its tri-partite and promissory nature, the amount in use exceeds the newly issued sum. This also applies when the rate of regular saving is more than the rate at which it is withdrawn. If on average over a few time-slices, the HOUSE-HOLDER saves and withdraws its savings at equal rates, there is nothing left to be multiplied, whilst if it withdraws more than it saves, the reduction too is multiplied and the total decreases.

Due to this cycling, the FINANCE INSTITUTION entity could lend out the new money several times over, were it based on the total sum, according to a money multiplying-effect, **MMt** . Consider the earnings of a previously unemployed house-holder, for which the GOVERNMENT has recently printed and issued fresh currency as wages. These earnings are immediately spent or returned as savings. Most of these bank-notes will continue to circulate,

but due to the bankers' fractional reserve accounting system on savings, eventually they will find their way to the bank vaults as savings deposits. Then the greatest value of **MMt** might be: **MMt = 1 / res**.

Where **res** is the average proportion of the deposited sums that banks frugally hold in reserve, (against a simultaneous demand for money, from many customers). The quantity **res** is not a fixed amount and in recent times may not even be stipulated by the Treasury (within GOVERNMENT), but it is taken provisionally as being fixed here. In practice an average proportion of the total sum of money **c** also is kept readily available by the households, producers, shops, etc. and known by them as the "float". This is done because the immediate and continuous return of it to the bank is inconvenient, so the multiplier might become **1 / (c + res)**… however it is also based on what is deposited and not on the total sum. Then this factor is also reduced in size due to the direct effect of **c** and this leaves **(1 – c)** of it for the actual money multiplier-effect, and:

$$\textbf{MMd = (1 – c) / (c + res)} \tag{35},$$

which applies when new money is issued through a bank or net savings grow. For example, when: **c** = 0.25 and **res** = 0.10 , (being typical values, similar to those given by J.B. Taylor in [40]), then:

$$\textbf{MMd} = (1 – 0.25) / (0.25 + 0.10) = 2.14 \ .$$

For this numerical example, the total rate of money circulation is more than doubled due to the bankers' action of drawing credit from 90% of the sums in the deposit accounts. Were it not for the size of **c** , almost all of the money would accumulate as reserves in the bank vaults, because on every savings cycle more is placed there. However, the stronger opposing influence of **c** on this is also apparent, when a smaller **c** = 0.15 is introduced, then:

$$\textbf{MMd} = 3.60 \ \text{or more than 2/3 being "deficit money".}$$

In times of prosperity when savings can earn high rates of interest, **c** becomes smaller due to the lower proportionate amounts willingly being withheld, whilst the turnover sum is much more. Consequently, ***without a need to issue new money***, the rate of circulation of the currency naturally adjusts itself to the changed conditions. This stabilizing effect is significant. It reduces both the ability of and the need for the GOVERNMENT to influence the rate of progress of the macro-economy, by control of either the banks or the quantity of money in use (but see also Chapter 16 for more discussion on

GOVERNMENT control). This premise is part of the classical theory of economics (pre-Keynes), but it is not at all popular today.

The existence of the money multiplier **MMd** also implies that much of the macro-economy operates by means of continuous outstanding credits (and the associated debits). Promissory money, fiat money (see next section) and the electronic pulses from magnetized plastic cards, circulate in place of most of the actual currency, as was described in Chapter 13. This money situation supersedes the simple banking one, without bank credits (or debits). As our money is earned and spent it returns to the bank as "deficit-savings" for recycling as new credit, possibly with a small sum being added to the vaults (see below). In practice, today these reserves are less strictly controlled, so the bank can create more of its own money and it usually does.

Indeed it is largely on a basis of loans and deficits that our economy runs, where our credit with the bank is being continuously transferred; we are mostly borrowing on our debt-driven system rather than using a true currency based one. These promises are the undertakings by borrowers to repay and they give the bank *the power to create money*. Continuously, new deficit time-limited spending-power is generated by our bank credits, which are also called "endogenous" or "inside-money". This terminology distinguishes it from the "exogenous" or actual "outside" currency which the GOVERNMENT prints or draws from the bank vaults in exchange for the Treasury-Bills, (as well-explained by C.O. Roche [46]). This activity fits in between the time-slices of the 6-entity model previously used. Whenever money is spent, most of it returns to the bank to be re-cycled again as a new loan.

It is by the (electronic) bookkeeper's transfer of numbers between the various customers' (and their entities') accounts, that we operate our monetary system of today, for the accurately measured exchanges of labour, goods, etc. Comparatively little hard currency is in actual use, but this deficit way of working does not change the effects of the 19 money-flows on the system. Nor does it alter what has been previously presented here about the different relationships between them.

With the two exceptions of HOUSE-HOLDER'S spending money and FINANCE INSTITUTION'S money reserve, the greatest part of the business is based on credit associated with the debt that is its due. The particular accumulations that were in Table 5 (of Chapter 6) include the various kinds of credits shown in Table 12.

TABLE 12. SUBSTITUTE MONEY CREDITS (OWINGS)			
<u>ENTITY</u>	Obtains **long**-term credit from	<u>Namely and by means of</u>	
GOVERNMENT	FINANCE INSTITUTION	Issued Bonds (and Treasury-Bills)	**Σ(M)**
LAND-LORD		Loans on site titles (land parcels)	L-F contract
CAPITALIST		Share certificates and mortgages	**Σ(I)**
FINANCE INSTITUTION	HOUSE-HOLDER	Savings certificates	**Σ(S)**
<u>ENTITY</u>	Obtains **short**-term credit from	<u>Namely and by means of</u>	
PRODUCER	HOUSE-HOLDER (through earners)	Wages, payment delay	**Wp**
HOUSE-HOLDER	PRODUCER (through commerce)	Goods, invoice delay	**Ch**
	FINANCE INSTITUTION	Credit cards (delay)	H-F contact

Much of the actual currency arrives as savings-reserves, kept in the bank vaults of the FINANCE INSTITUTION. This suggests that the money business, performed by the GOVERNMENT, is that of introducing new currency into the system. This money freely circulates, but due to the bank credits needing to be protected it finds its way to the bank vault. Whilst this occurs the value of the currency in use gradually inflates (not the macro-economy itself), which reduces the effective rate of interest on all borrowings. However, it is impossible for the GOVERNMENT to run out of money because with the Treasury it controls the amount of newly printed or recently borrowed currency continuously entering the system. This activity brings the system back to normal. Consequently the nature of money and the GOVERNMENT'S attitude to it at macro-economics levels has greatly changed; with the exception of run-away (or hyper-) inflation, the older belief of the (honest) simplistic need to reduce the National Deficit today is unfounded nor is it deemed to be practical.

Banks are not always sufficiently prudent in this aspect of their activities and may out-perform their balancing acts with the handling of large investments and equities. When demanded back in large amounts, the credit they extend can drive them to bankruptcy (and later return to service, after re-investment has eased the situation). With the recent relaxation in the legislation over the proportions of their reserves, certain big banks that speculated in deficit

accounts have successfully managed to borrow from the Treasury (for short-terms, sometimes though not always at low-interest discount rates), rather than fail after these sums were temporally called in. This "bail-out" action has allowed these overdrawn banks to withstand the instability of recent speculation in deficit holdings, enabling their associated significant losses to be kept to a minimum.

Since trading-objects, silver and gold are no longer used as money and credit is extended from savings, the money-multiplier effect applies whenever the GOVERNMENT entity introduces new currency into the system. It might be thought that it provides this entity with a powerful way to stimulate the business activities and indeed many Keynesian-schooled economists still hold this to be true. But as has been previously suggested this claim is based on incomplete information. In the following chapters the capacity of the GOVERNMENT for influencing the amount of macroeconomics activity will be better explained.

14.2.2 Relaxation from the Gold Standard (as described in Chapter 13.3.3)

The previous discussion of banking has got somewhat ahead of itself and the explanation about the failure of the gold-standard needs expansion. The ideal of absolute money-values has not endured. The circulation of paper money and promises backed by gold with simple banking as described above has serious limitations. Even with the issue of Treasury-Bills, when the GOVERNMENT borrows money from the banks or the public, a need arises for more currency to be introduced. The obvious solution is for the GOVERNMENT to print more money and to spend it into the system for building new projects and infrastructure of national value and use. The reasons for the failure of the gold standard are described below along with the effects of the artificially raised circulation rates due to this fait money.

a) Added Money in Circulation: Instead of GOVERNMENTAL borrowing, raising taxes or cutting some of its expenditure (none of which would significantly enlarge the amount of macroeconomics activity, the circulation being redirected but not increased), the GOVERNMENT issues greater quantities of money to subsidize and relieve poverty, to pay for wars, for spending on national projects, etc. The motivation also may be due to population growth, there being more business activity within the country. A rise in the prime rate of interest and its effect on circulation-rate (see Chapter 14.1.4) has adverse effects and the use of post-dated cheques and other temporary credits has already reached a saturation level. The GOVERNMENT wants to circulate more money without its

value decreasing, by keeping its scarcity uniform. When issued in moderation, the new currency should not cause monetary instability by being incommensurate with the available quantities of gold, but when sufficient supplies of gold are not found, its exchange criterion can no longer be met.

b) In fact, <u>the added money</u> entering circulation (called fait money, because it is un-backed by gold) initially encourages labour and trade and tends to reduce the level of unemployment--a similar result to what occurs after the discovery of a new gold-field. However, in practice this desirable result does not endure. Intentionally or otherwise, the value of the currency inevitably shrinks after the GOVERNMENT releases more of these ubiquitous bank notes. When too much money becomes available, the competition to buy goods inevitably results in raised prices and creeping inflation and gold becomes more expensive too, unless more of it is found.

c) <u>Technical Progress</u>: The value of money increases when technical progress has been achieved within a country, so that it requires less effort than before to produce the same quantity of goods. Even after certain industrial monopolies have exploited the lower production cost by skimming-off some of the excess, they still can manage to sell the produce at lower prices. Then the country's standard of living rises--the same money buys more or better goods. Due to the dynamics of this change, at least for a short term, the money now represents greater value and provides more wealth. Newly produced gold might do this too, were its production cost to have reduced in parallel to the rest, but it is more likely to be harder to obtain at greater cost and the gold standard cannot be maintained.

d) <u>Trade Imbalance:</u> This is when more goods are imported than exported. Unless there is a renewed demand for goods that are made in the country of this money's origin, its value declines relative to the export country's currency. It results in growing amounts of the home country's money being held abroad. To avoid the resulting devaluation and to stabilize the value of this home currency, the money should be bought back by the GOVERNMENT, using the local stock of gold-bullion. This leaves insufficient gold to back the money that was printed at home. Although hoarding gold seems to be less important today, at home it becomes comparatively scarce and more costly. With variation in the local price of gold, the different national monies have fluctuating exchange-rates. Today, the currency of many nations is neither fixed in value to gold nor directly exchangeable with it at the banks.

Due to these 3 reasons, modern governments find that it is impossible to maintain a gold-standard, although they would prefer a fixed international exchange-rate for their currencies. Money has no absolute value so theoretical macroeconomics is more-complicated, dynamic and apparently less precise. This aspect of money was previously avoided here, by taking short time intervals and constant money-values.

Actually, the banks could be allowed to print their own currency and lend it for interest. This was practiced in Scotland for 150 years, with the agreement of the regional authorities. When one of these "foreign" bank-notes came into the hands of an English money user, it was spent in the normal way. However, on its eventual arrival at an English bank, the appropriate Scottish bank would then exchange it for a Bank-of-England note instead. As previously suggested, this freedom to create money is not necessarily an imposition on the macro-economy, provided that the GOVERNMENT does not permit its introduction to become uncontrolled. The recent introduction of bit-coin and other new forms of electronic currency has the same effect. Providing that its organization is reliable and its value secure, it is not a danger to the way that a country manages its monetary affairs.

This ability for a nation to facilitate super-barter is a natural result that directly follows from the basic principle of promissory notes and post-dated cheques. However, many GOVERNMENTS prefer to (unnaturally) control the total amount of money available and this can lead to strain within the monetary system, due to differences in the interest rates on loans offered by the banks and the average dividend on equities, or due to the GOVERNMENT deliberately causing inflation etc.

14.3 The Up-Dated Macro-Function of Money and its Implication

Money provides a convenient means for direct business transactions and the banker's institution of fixed-sum time-limited credit allocation, allows money to stimulate progress within the national economy. This applies to national as well as to private debts. Less directly, this institution also appears to give the GOVERNMENT some means to control the rate of progress of the national economy.

With the extension of credit, which is taken from past savings (and the need to return interest on it, so as to forego immediate repayment), it might appear that new money has been created and with it an increase of business activity. However, even when business was by barter, the use of signed promises for

an expected supply of goods had the same effect as the use of bank-credit. This ability for providing credit existed even before regular currency existed and the ensuing macro-economic beneficial effect on trade was already at work. Consequently we are unjustified in regarding these loans as a smarter way of encouraging more business activity. What often is unfair is the bankers' micro-economical choice of who receives them.

The amount of interest that accrues with credit implies that there are benefits obtainable from the resulting redistribution of money and wealth within the monetary system too. By this device, certain banks enjoy the advantage in providing the loans whilst other entities savour the greater freedom of acquisition and use of the durable capital goods or even of the resulting consumable produce. Inadequacies of the MESS, to be explained in Chapter 16, may be exaggerated by the unfair use of the credit, but this faculty to borrow and pay for its privilege is not the root cause of the limitation felt by those not enjoying this advantage, for reasons to be described in the later chapter.

The inevitable failure of the gold standard, or any other absolute way of fixing the value of money, is insufficiently good a reason for barter to return, although this aspect of business should not be forgotten by those who replace its function with money. For a fixed amount of printed money in a country, the total amount of it in circulation would tend to decrease with growing prosperity, as savings progressively accumulate and their (proportional) reserves are stored by the banks. Consequently, for the convenience of less frequent visits to the bank, new money should be regularly issued at a very slow rate. Its steady introduction by the GOVERNMENT may also allow for a reduction of other taxes. The interest on savings will cover some of this propensity to grow, unless its effect is disrespectfully lost due to inflation.

The attitude to money is now changed. The frequent commercial exchanges of fiat money for goods imply that there were prior transactions made by the purchasers through the banks, to cover the face-value of the promissory money with something having real value. And after the trade has occurred, by implication the sellers also will establish similar monetary understandings. This applies even without the gold standard being maintained, although the public and the GOVERNMENT both know that the banks currently have no real means for keeping up this convention. But people prefer to fool themselves and psychologically the electronic counter-part of these fiat notes (which substitute for the precious metals), take on imagined values of such significance that the banks need to protect themselves from the criminals, who daily hack into the banks' computer systems to happily steal from them.

CONSEQUENTIAL MACROECONOMICS

During times of prosperity and population growth, the added money-flow exceeds the growing bank reserves, although this amount is imprecise due to the ability for business people to generate their own (secondary) money by advancing temporary credit. This brings into focus the Keynesian claim of "pump-priming" [42] after the Government has given itself more to spend. The tax money previously used to subsidize the unemployed is now available for paying wages, after a quantity of the new money apparently is printed and becomes available. The Keynesian Theory claims that with this first payment, most of this new currency continues to circulate due to the greater extent of business activity. However, this theory does not allow for the associated reduced demand for loans and the lower quantity of inside money that otherwise would support them. Fewer numbers of people now will need these temporary (but continuously replaced) funds. The claim of direct GOVERNMENTAL control of the rate of progress by circulating greater amounts of money is unjustifiable, because there are so many alternate ways for obtaining credit. What the GOVERNMENT really does when it successfully "creates" new jobs (see also Chapter 16.6), is to make available some additional land-space and durable capital goods, namely the physical means for employing additional government workers to improve the surroundings, social services, etc. Their increased demand for consumer goods will stimulate the need for more labour elsewhere and this absorbs the population growth in a stable manner and leads on towards greater general prosperity.

CHAPTER 15. ADDITIONAL MACRO-ECONOMIC MONEY MATTERS

The subsequent development of the banking-system brings to the community at large some even more-significant features of the money-exchange business than what were previously described. In this chapter are considered two of these additional macroeconomics functional characteristics. They directly relate to the FINANCE-INSTITUTION, CAPITALIST and GOVERNMENT entities. These features are the Stock Exchange and the various governmental (Treasury) control techniques for the rate of progress of the MESS.

15.1 The Stock-Exchange and Public-Companies

15.1.1 The Stock-Exchange

The stock-exchange or market is the most important trade-centre for commercial transactions related to the public-holding of durable capital goods and their associated valuable legal documents. Its place within the macro-economic system being modelled here, lies inside the FINANCE INSTITUTION entity, although the introduction of new shares is the result of an interaction between this entity and the CAPITALIST. The stock-exchange has two functions, the first being when a company is starting up or expanding. Then the directors seek money for use in the purchase of durable capital goods and access rights to sites of land. This is achieved by the CAPITALIST entity function of offering for sale to the general public (along with their prospectuses), specific numbers of "shares" in "public" companies that have limited liability in the event of a financial failure. Once purchased these share-certificates are stored safely in the bank vaults. In the model used here, the shares are purchased by the FINANCE INSTITUTION entity. It my do this independently or for clients whose savings are ear-marked for this purpose. Provided that the prospectus offered for the shares of a company is reasonably attractive, there is a good chance that the shares will be taken up. This also depends on the general state of the macro-economy and on the reputation of the board of directors of the prospective company, in their earlier business transactions.

The money is then used by the CAPITALIST in the purchase of suitable durable capital goods and for the long-term lease of a suitable site from the LAND-LORD on which to establish the company. The business activities within the company are expected to yield significant returns from the sales of

the product, once the possible costs of raw-materials, labour, land-occupancy and taxes have been met, as well as covering any subsequent insurance, maintenance and/or depreciation in value of the durable capital goods. These returns or dividends are paid annually or semi-annually to the shareholders for the use of their invested money. Dividends are similar to the interest on savings, however there is no reason for them to be paid at the same rate. In our model, the owners of these public-companies consist of the CAPITALIST entity, whilst the management and actual use of the durable capital goods etc., comprise the PRODUCER'S activity.

The second function of the stock-exchange is due to the subsequent redistribution of the stock-holdings amongst the investors, as expressed by the sale and purchase of existing "second-hand" shares (sometimes called equities). When a company shows signs of success, even before a dividend is declared, the price of its shares rises due to nervous speculation on the part of certain share-dealers (brokers). The opposite result occurs when the business shows signs of decline and it may not pay reasonable dividends (or any at all). After their shares have risen in value, these speculators will gladly sell them for more than they previously paid, but after a decline in price panicky share-holders may offer loss-cutting bargains. The actual value of the durable capital goods within the company for which the shares were originally sold, has not necessarily changed and normally is a more stable quantity. But it is their potential value (see Chapter 13.1) which has altered. This effect is not included in the MESS model, although the current total value of all the shares (or investment $\sum(I)$) can be regarded as an exogenous type of variable.

15.1.2 Dynamics of the Stock-Market

Whilst this subject is scarcely a part of the banking activities, it is strongly affected by the general rates of interest. The dealers in the stock-exchange are very anticipative of any rumoured or reported changes. A change in the Prime-Rate, particularly as applied to Treasury-Bills, has a serious long-term effect on the aggregate of many of the marketable shares. Their value may rise (a "bulls-market", due to a reduced Prime-Rate) or fall (a "bears-market" for a greater Prime-Rate). However, these changes are the opposite of what naturally occurs, when in parallel a particular business flourishes or declines and the declared dividends are greater or smaller, respectively. Consequently, the combined result of these opposing effects is not always correctly anticipated. The situation is complicated by possible altered conditions (which can be introduced between the time-slices of our model), that feed-back on the general prosperity of the country and affect its currency

exchange-rates too. The speculators try to adjust their "investment-profiles" even before the new Prime-Rates or dividends are formally announced. Small changes are big-news to these mercenary and mercurial share-holding investors, with the result that the variation of a particular company's share-price does not always properly represent its true rate of long-term progress.

When the current value of any of the share certificates, bonds or title-deeds needs to be ascertained for purposes of trading, the price may be determined by the "capitalization" of their yields, the latter being received as dividends, interest or ground-rents. The values that result are after these returning sums have been divided by the average rate of interest of the whole macro-economy. In the case of company shares, the speculative values adjust themselves automatically, by the freedom of the market to trade. This means that the expected dividend on each share-holding is related to its current purchase price. The subject is complicated by the times when the dividends or interest are actually paid, or when the leases on a holding in land terminate. The same capitalization effect applies to ground-rents. However with land, these quantities tend to be exaggerated due to some sites being held out of use and the degree of the land monopolization. The competition for the reduced-quantity of available land often results in raised prices and subsequently greater production costs, etc.

During times of industrial depression, the value of the shares falls and unsuccessful companies may find that they are unable to pay out any dividend at all. They may even be unable to balance their income/expenditure accounts and in these circumstances they need to declare a state of bankruptcy. Then the durable capital goods and other valuables that remain in the company are sold (by a nationally appointed "receiver") and the resulting money is distributed amongst the share-holders, whose shares by this time, may have fallen below their original values. The directors of the public-company are not legally bound to return all of the investment money due to the limited-liability clause, which is one of the general conditions for public-company formation. Entrepreneurs and private companies do not enjoy this degree of protection. Their owners are liable for all of the losses (or fraud) associated with company failure.

In the case of investment in banks, the situation becomes even more complicated due to independent trading between banks of blocks of debts, particularly mortgages, and their anticipated degree of assurance of their steady redemption. After much money has been invested in real-estate and its prices have become badly inflated, a point is reached where the demand for new property slows. Then this continued speculation ceases to yield adequate returns on the more-recent acquisitions. The ensuing abandonment

or foreclosure of some of the un-paid real-estate and the debts of their owners, force the banks currently owning the mortgages, to sell-off the property at a loss. The share prices of these banks will fall after their investors and savers learn of the business-failure and withdraw their financial support. In order to avoid bankruptcy an appeal by the banks for loans from the Government may be effective. This is with the belief that the stock-market will eventually recover after the panic of selling shares subsides. Then the liquidized assets are re-invested elsewhere and of necessity the money returns to the banks.

15.1.3 The Substitution of Investment Between CAPITALIST and GOVERNMENT

Within the FINANCE INSTITUTION, there is visible a continuous flux in the advantages for investment in the public shares of the CAPITALIST, as compared to the National Bonds of the GOVERNMENT. The rates of interest being offered for investment in National Bonds **M** alter and they compete with the dividends from company shares I. These quantities are not physical in the produce sense--both reflect the current state of the macro-economy, rather than being fundamental to its existence. The decision to exogenously increase the rate of interest on re-issued National Bonds, can attract savings towards the National Bank and away from investment by the CAPITALIST in durable goods. Most likely, the change in the Prime-Rate of interest on loans to the GOVERNMENT is a follow-up of the general performance of the stock-market, which in turn depends on the dividends from the (comparative) success of the production process over the more-recent time-slices. Even when there is little money for re-investment, the entrepreneurs can access the more obsolete durables which sometimes can be used more effectively and at lower cost outside the influence of the monopolistic concerns. So the production costs may even be lower than when taking the path for introducing the latest technology.

15.2 The Methods Available for the GOVERNMENT to Control National-Progress

With regard to money, the primary financial role of the GOVERNMENT entity is to balance the national annual budget. However, this action of regulating the incoming and outgoing amounts of public money also is thought to influence the progress of the rest of the macro-economy. These operations are closely connected with the manipulation of the banking-money, through the ability of the Treasury (and the National Bank) to issue or withdraw bank-

notes. Also and less directly, it is due to the capacity of local banks to continuously extend credit for interest from newly-deposited savings. These features of the system apparently provide the GOVERNMENT with certain limited means of regulating the progress of the nation over both short and longer periods of time and to attempt to act as a steadying influence on it.

When trying to control macro-economic progress, there are available two basic approaches that the GOVERNMENT possibly can adopt, that are called the fiscal and the monetary methods. The fiscal budgetary-control methods act directly and have an immediate effect on the money within the macro-economy. The monetary banking-control methods are slower and are more-closely connected to the money-system, only subsequently affecting the money-supply and the demand for goods etc. They act less directly and require a longer response-time, which may exceed a year before their effect is felt. These methods are summarized in Table 13 and described below. In some countries, the National Bank handles the monetary items on behalf and for the GOVERNMENT.

TABLE 13. THE METHODS AVAILABLE FOR GOVERNMENTAL CONTROL OF THE PROGRESS OF THE MACRO-ECONOMY		
CATEGORY	**FISCAL APPROACHES**	**MONETARY APPROACHES**
POSSIBILITIES THAT ARE GENERALLY APPLICABLE TO THE TREASURY AND GOVERNMENT	a) Maximum Price-Fixing of Certain Goods and Services b1) Total Amount of Taxation (National Income) b2) Relative Effects of Different Taxation Methods c) National Expenditure (Outgoing)	e) Adjusting the Prime-Rate of Interest on new Bonds of the National Bank f) Adding or Removing Currency from Circulation, (Deliberate Inflation or Deflation)
APPLIED BY GOVERNMENT TO THE BANKS	d) "Open-Market" Operations on Bonds for Annual Budget Balancing	g) Re-Setting the Minimum Proportion Of Bank Reserves in Savings-Deposits (mostly out-dated)

15.2.1 The Four Fiscal-Control Methods

The direct fiscal methods of GOVERNMENT control are briefly described here, for the sake of completeness. Only one of these methods is related to the broader subject being covered in this chapter, namely the greater

consequences of the nature and use of money, and of the banks ability to invest and lend it for interest.

a) Limited Maximum Price of Certain Goods and Services

This temporary and extreme method of control is used during and shortly after a war of long duration, before the rationing of goods for personal consumption is completely abolished. Whilst certain basic items of consumer goods may still be subsidized, the purpose of the price-control is to ensure that the poorer parts of the community, including fixed-income pensioners, don't pay much more than the minimum production costs. The price-controls constrain monopolies from their unjustified exploitation of the newly developing markets, before the effects of competition begin to be felt. The entrepreneurs may already have made some price cuts, so as to compete and stay in business. The general result of price-control is a reduction in the quality of the produce, because the producers always aim to operate as economically as possible. The effect of the lower prices is to boost the demand for the particular kinds of goods and this slightly increases the number of employees needed in industry, without (at least) initially creating a rise in the overall value of the goods exchanged.

The maximum rent is also limited on land and premises that are leased or hired-out for agriculture, residence, commerce or industry. Consequently, these temporary draconian measures find application in controlling the unbalanced rate of national recovery, particularly in the poorer sectors, although they also encourage the development of the black-market in scarce luxuries.

b) Taxation Changes

b1) The amount of GOVERNMENTAL money-income is controlled (exogenously) by modifying the total sum taken in taxation. This income is collected from the four possible kinds of taxes that were previously described, namely **Th, Tl, Tp** and **Tc** (see Table 3 in Chapter 6). The changes to the total amount of national income find use in connection with the national expenditure, see item c) below.

b2) The short-term effects of making a modification to each of **Th, Tl, Tp** and **Tc** are different, as was shown in Chapter 11 and Appendix D. This includes any innovative taxation methods and their overall effects. The various proportions of the tax with respect to each of these methods are the significant means for directly controlling certain parts of the national progress, in the short-run. However, most

of the longer-term effects are less significant due to money re-distribution, see Chapter 16.6.

It is a frequent claim by the consumers simply wanting to reduce their income tax payments, that this would provide them with greater funds and the subsequent effect on the whole economy would be beneficial. However, after considering all of the macroeconomics system, the actual short-term effects of doing this were found to be the opposite, see Chapter 11.1 Example 2. With lower taxes there is a reduction in the number of government employees and after considering together all the consumers, it is found that there is a reduction in the GDP. By adopting this broader-attitude, the greater needs of the community are better-judged. The same kind of result occurs whenever a law favours one part of the community. The classic example of an artificially raised demand for the produce of the Candle-Makers, see F. Bastiat [11], does not benefit more than this small fraction of the population, in spite of their erroneous claim that this innovation creates greater macro-economic activity throughout the whole social system. This fallacy neglects what otherwise happens, without the introduction of this change. It was well-described by Henry Hazlitt [19], where he showed that the subject is more involved.

As was seen in Chapter 11.1 (Table 10), by examining the effect of tax changes on the complete system, the different taxation methods have transitory beneficial or harmful effects on various parts of it, and on it as a whole. In particular, comparing the effects of raised taxation in Example 3 and 4 proves that the introduction of a land-value tax stimulates the overall system by 3 times as much as what results from the same fiscal rise in income tax.* Using the comprehensive macro-economic model given here and by applying the methods of calculation shown in Appendix D, the inquisitive reader may explore these kinds of results in greater depth, many of which are not obvious.

c) National Expenditure Changes

The GOVERNMENTAL money-outflow is controlled by (exogenously) modifying the total national expenditure. This is due to the various kinds of payments covered by **Cg**, for the costs of running the various ministerial offices such as defence, justice, public-health, national insurance,

---

* N. Gregory Mankiw *et al,* in the third edition of their book Essential Economics" [47] (page 168) quotes Milton Friedman:
"In my opinion, the least bad tax is the property tax on the unimproved value of land, the Henry George argument, many, many years ago."

education, etc. as well as the expenditure on national projects. These activities are necessary for managing the country as a whole, the poorer parts of which would otherwise lack the services, whilst the more affluent parts would have to pay more without necessarily obtaining better treatment. Whilst being a part of this activity, the subsidy given to the "deserving poor" is already included in our model by its subtraction from personal income tax **Th** before it passes into the analysis.

Thus the Treasury or Finance Ministry has the responsibility to decide, govern and control the rates at which the nation's money is both gathered and used. During periods of rapid economic growth the amount of tax collected becomes greater and a surplus occurs in the budget. The balance of this money may then be stored in the vault of the National Bank or used to reduce the National Debt. In times of depression or slump less tax is gathered. Then a deficit budget can draw on this surplus or increase this Debt. Thus the Government has a limited control of the National Debt by this means see below. Otherwise the money would be loaned or invested elsewhere.

When b) and c) are combined, the GOVERNMENT is in the process of balancing the budget. This is usually achieved with the open-market operations described below, as a supplementary method of fiscal control. These fluctuations hopefully keep steady the average amount of national progress, when taken over a span of many years.

d) Open-Market Operations for Annual Balancing of the Budget

The action starts by the GOVERNMENT (exogenously) releasing or recalling Treasury-Bills to or from the National Bank. In turn this agency issues or withdraws National Bonds **M** that are held for limited periods in the common banks at the investor's level. These changes are known as open-market operations, money being either borrowed or returned to the community through various bank-related transactions. It is a refined way by which the GOVERNMENT adjusts the size of the National Deficit whilst completing its annual balance-sheet.

The banks are usually eager to invest in these long-term "guilt-edged" securities, due to their high reliability compared to public company shares. From the current budgetary proposals, the quantity of these bonds likely to be offered or redeemed each year to adjust the annual size of the National Deficit, can be estimated by the banks, together with the rate of interest in anticipation of the annual rate of progress.

(Open-market operations should not be confused with the printing or withdrawal of money from circulation which causes deliberate inflation or deflation of the currency over a longer time. These can be combined with open-market operations too, but it is better to categorize and describe this combined activity as a monetary function, see below.)

These four methods a) to d) are regarded as being the direct means of fiscal control, where in their initial phases they all act immediately or almost so.

15.2.2 The Three Monetary-Control Methods

These three monetary methods of GOVERNMENT control are described below. They are slower-acting, being closely connected to the nature of the banking-system. These three monetary methods are treated here in greater detail than the fiscal ones above, since they are more relevant to the main subject of this chapter.

e) Changing the Prime-Rate of Interest of the National Bank

In cooperation with the (somewhat independent-acting) National Bank, a change in the Prime-Rate is made. This is the rate at which interest is paid on the nominal value of the recently issued (renewed) bonds **M** that are covering a part of the National Debt Σ**(M)** or deficit that has just been redeemed. The Prime-Rate is usually set at the lowest rate that the National Bank can reasonably offer, when the sale of renewed bonds competes with the other shares in the stock-exchange. The aim is to make the cost of the loan to the tax-payer as small as possible. The greater reliability in these government-based holdings allows this rate to be slightly lower than the average dividends being returned on shares, but it is usual for new issues of the bonds to be for long-terms and the new rate anticipates the rate of inflation, that otherwise reduces the ability to attract investors.

The three kinds of rates of interest **r** are on savings Σ**(S)**, on bonds Σ**(M)** and from dividends on shares Σ**(I)** . They are normally of about the same size and their variations are in parallel. Whenever a change is made in the Prime-Rate of renewed bonds, even though the percentage is small, it has a big influence on the spread or withdrawal of recent investments by the entrepreneurs in their production activities. Public companies whose shares produce high dividends are less seriously influenced, but those whose dividends are below the average are likely to experience more

significant changes in their stock-market trading prices and may even go out of business.

If the rate of progress of the macro-economy is thought to be too rapid, the National Bank, with cooperation from the Treasury, raises the interest rate on its latest bonds issue. (The raised rate encourages greater amounts of savings, which increases the bank-reserves, so money is withdrawn from circulation. However, the higher interest rate also encourages people to retain smaller amounts of free-cash. So with both effects acting together, it is unlikely that additional currency needs to be issued.) The action draws money away from new investment in company shares. This is adverse from the CAPITALIST'S viewpoint, but it is necessary so as to slow down economic progress and to reduce the growth in company share values. Conversely, the reaction of the Treasury to an economic slump in trade is to reduce the Prime-Rate on the renewed bonds. This affects savings too, which yield less interest, so it encourages the consumers to keep more money in their pockets (and to spend it) and to put less in the bank. Cheaper money instigates the CAPITALIST to invest in durable capital goods too.

Anticipation of these changes has been made harder in recent years due to the decision of the Bank of England (the British National Bank) not to continue to announce the new Prime-Rate at the stock-exchange, as was done before. The same changes will occur to the share-prices, but after a slightly longer delay. This innovation is thought to reduce the degree of nervous response by the speculators. The subsequent variations in the Prime-Rate and in the average dividend-rate are unlikely to be much different.

When there is pressure to borrow more money than currently available, the viable Prime-Rate rises naturally and reduces this demand. Similarly this rate falls when too much money accumulates within the banking-system. These adjustments depend on the degree of business activity (as expressed by the aggregate dividends paid on shares). Consequently, the system automatically regulates itself (by negative feed-back) against any pressure for the economy to inflate or deflate.

A sensible Treasury will not issue nor withdraw money to specifically cover these changes, because of the natural way that the revised rate of interest stabilizes with the altered amount of currency in circulation. This idealized theory is the classical approach that was taken before J.M. Keynes in 1936 showed the need for governmental control to override

these natural trends. He claimed that this control is advantageous. However, experience has shown that this somewhat useful feature of our social organization degenerates when the system receives too much interference from the Government.

A finer degree of control of the progress of the macro-economy may be obtained by more frequently adjusting the Prime-Rate of interest slightly above or slightly below its natural level, as determined by average share performance. This implies that the Prime-Rate is both an effective means of control and a useful measure of the rate of progress of the whole system.

A decision to raise or lower the Prime-Rate of a major country's National Debt also creates a world-wide response in its company stocks that are traded internationally due to a re-assessment of the value of these investments. The foreign investors may decide to add to the amount involved or alternatively to withdraw their money. To these investors, the value of the home country's currency has altered. If large sums are involved, it will affect the exchange rates, unless the National Bank trades sufficient of its reserve foreign-currency (or gold), to compensate for the change in the effective value of its currency.

f) Adding or Removing Currency from Circulation (Deliberate Inflation or
Deflation)

When money is printed and released into circulation, or when currency is withdrawn and secluded, these activities also are regarded as monetary. With greater sums being issued, the amount of GOVERNMENTAL subsidies and expenditure on national projects **Cg** is increased. Alternately after the Treasury withdraws money, this excess is placed in long-term storage or destroyed. Then the subsidies and projects are curtailed. Money can be added to the system by means of open-market operations that reduce the size of the National Debt. This involves buying back National Bonds (or redeeming them without reissue). It combines this monetary activity with a fiscal one, as described in d). However, the sale of bonds followed by the removal of the resulting currency from circulation, are unreasonable operations and the theory is asymmetric here. When money is to be withdrawn other fiscal processes must precede this activity. In most countries this Debt is continuously growing as the population increases and/or progress is made. Limitations in the magnitude of this Debt have never been prescribed for very long, but since the country pays interest on it, there clearly is a need for some constraint in its size.

After money is added to the system, the initial response of the community is for greater demand. This suggests that the GOVERNMENT'S deliberate expansionist action is a useful way to recover from economic depressions, but today its long-term effects are recognized as being adverse. Unfortunately, this action subsequently cheapens the value of the nation's money including what is in savings, which greatly exceeds the amount of currency in circulation. After wages catch up with prices the initial stimulation that came from inflation is lost. Generally there is reluctance to use this monetary instrument. Deliberate money-inflation is regarded as a dishonest form of behaviour by central-acting Governments, who use it to stimulate demand and simultaneously to reduce the effective size of their National Debts. J.M. Keynes was well aware of this and he even quoted Lenin: "By a continuing process of inflation, government can confiscate, secretly and unobserved, an important part of the wealth of their citizens" [49] –a shocking admission of deceit.

These open-market operations also apply pressure to adjust the Prime-Rate. Similarly, when this rate is changed (see above e)), the bond's market will be affected. Consequently a Government wishing to control the degree of national growth should allow for the influences in both of these quantities, so as to avoid conflicts.

(These adjustments also affect the international exchange-rates, which are expressions of the value-ratio of imported to exported goods. In the case of inflation, prices rise and fewer goods are exported compared to the country's increased and cheaper imports. After the exchange-rate has become stable again, and the foreign currency is more expensive to acquire, the situation returns closer to what it was previously. Deflation works in the opposite manner.)

g) Changing the Minimum Reserve-Ratio on Savings-Deposits

In theory, the credit that banks extend comes from their savings-deposits. Not all of the money that is being kept for the savers by the banks is allowed to be used for this purpose. Each bank is required to hold a reserve for use when there is a sudden demand for its liquid assets. The reserve is a small proportion of the total savings-deposits (and may include part of certain current accounts too.) The banks store this reserve sum, which typically is 10% of the total, in their vaults (or those of the National Bank). The introduction by the Government of changes to this reserve-ratio, is supposed to control the amount of business activity,

allowable beyond the degree to which credit has already been extended. However, in practice the strict enforcement of this restriction has recently given way to "bail-out" loans from the Treasury, on which the discount-rate of interest is deliberately set usually high but sometimes unusually low too! (as in the US during the 2008 bank crises). Temporary regulations are sometimes introduced, to freeze certain other bank reserves.

It is easy to blame the banks for allowing their reserves to become too low and (since they collaborate in investment with the land-owners and speculators) for being unable to determine when the land-value bubble is about to burst. But banks often are too close to the money action to be willing or able to see the bigger picture. The bank's job is to supply as much credit as possible and it is difficult for them to decide how much savings will need to be returned at any specific moment. Some banks even find ways to disregard the minimum sums that they should be reserving and they are likely to be in difficulty when a depression arrives, so the Government applies a less critical constraint here, which causes losses rather than failures.

As seen in Equation (35) in Chapter 14.2, the amount of credit that is provided by the banks is also due the effect of the money-multiplier. If we make the same assumption, suppose that the Government decides to increase the reserve-ratio **res** from 10% to 12.5%. Then a diminished proportion of:

$$(12.5\% - 10.0\%) / (1 - 0.125) = 1.625\%$$

of the savings-deposit money is involved, it no longer being available for new investment. The direct effect of the greater reserved sum is that it reduces the total future credit by this proportion too. The money-multiplier also changes from 2.14 to:

$$(1 - 0.25) / (0.25 + 0.125) = 2.00$$

due to Equation (35). This causes a reduction of:

$$1 - (2.00/2.14) \text{ or } 7.14\%$$

in future investment. Thus the total effect is 2.35 times greater than the initial change made to the reserve-ratio of 2.5%, which suggests that this method of GOVERNMENTAL control is a powerful device. However, this control instrument is not often used, due to a strong reluctance to change the requirement and also due to the use of discounting on loans by the Treasury.

The reserve is basically intended to cover a flood of customer withdrawals that follow a sudden lack of confidence in the banking system. This can occur after the economy becomes depressed and more money is needed, or during the start of inflation, when the demand for money is high and/or the consumers want to stock-pile goods before their prices rise. When a bank finds itself with money reserves that are too low, it can try to borrow from another bank. If this is not possible, for a short duration the bank may also borrow from the National Bank at the "window of last resort" (whilst simultaneously calling-in some of its heaviest loans). Borrowing from this window is discouraged and the "discount" rate of interest is not intended to provide the debtor bank with the means for direct investment, only to help it cover its immediate (and temporary) financial needs. The effect of extending credit to a bank in general and from this window in particular, is to soften the impact of the unexpected shocks.

In extreme circumstances where a run on the major banks is likely to subsequently bankrupt a large part of the community (due to the resulting panic to obtain a greater liquidity of funds) it is possible for the Government to print or issue and lend these ailing banks "bail-out" sums (for short time intervals), in order to avoid a national financial collapse. The effect of this action is the opposite of the Government deciding to increase the savings reserve-ratio. It can only be applied for a limited time before the effects of the freer-moving money causes the currency to inflate, so it should be very carefully controlled.

15.3 GOVERNMENT Policy-Making

15.3.1 Classical Policy

The classical view was that the national system of money in use is a self-correcting one over which no control is needed. There was no allowance for changes in the value of money, even after new quantities of it were occasionally issued. The gold-standard had not yet been formally abandoned and when the Government needed money it would normally borrow it from the banks (and public) at the same cost (to tax payers) as other kinds of credit. Consequently the Government preferred not to interact with the bank business. The Prime-Rate of interest on new Government Bonds conformed to the average dividend-rate from investment in the stock-market. But subsequently, during war years when gold was exported and inflation deliberately introduced, the Prime-Rate of interest on National Bonds was

raised, to compete with the other kinds of investments, where a parallel long-term increase in share-values could reasonably be expected.

With the development of city commerce and the growth in power of banks, the macro-economy became less stable and the adverse effects of the limitations in the social system, to be described in Chapter 16, became more significant. It was found that steady progress was not possible without fluctuations or "business-cycles" occurring. (The reasons for these cycles have been sought for many years. Recently, A.J. Auerbach and L.J. Kotlikoff [50] provided seven possible explanations, but they found all of them to be unsatisfactory, because none of the associated models was sufficiently general and each applied only for a particular circumstance. The sole explanation having real merit was given by Henry George in 1879 [8]. It is due to the varying degree of speculation in land-values.)

The natural trend of the macro-economy is to expand in periods of prosperity and to contract during intervals of decline. Both these trends are the opposite of what a GOVERNMENTAL stabilizing policy sensibly prescribes. Today, governments recognize and adopt various policies in attempts to control the progress of the macro-economy, but the classic attitude was to wait and anticipate a natural returning trend.

15.3.2 Keynesian Policy

The suggestion that governments could and should control the national finances came from J. M. Keynes in 1936 [42], in opposition to the Classical Theory. The Keynesian policy requires that the GOVERNMENT entity together with the central National Bank, adjust the speed of circulation of the currency so as to influence the medium-term (incremental) expansion or contraction of the macro-economy. Normally the quantity of currency in use is neither created nor destroyed, because the incoming bank-money is immediately exchanged for goods, services and valuable documents by each entity including the GOVERNMENT. Decisions for investment are freely made, in either interest-yielding savings or newly-issued share-certificates of public companies or National Bonds, partly depending on the Governmental policy for setting the Prime-Rate. Regardless of where it is placed, the effect of the resulting money circulation gives the PRODUCER the impetus to make durable and consumer goods for commerce and use by the wages of the HOUSE-HOLDER.

1936 J.M. Keynes [42] with J.R. Hicks [14] suggested that monetary adjustments usefully could be made, but in practice it took nearly ten years before this policy was seriously applied in 1945, after the Second World War.

CONSEQUENTIAL MACROECONOMICS

This was the first deliberate attempt to introduce a counter business-cycle fiscal technique for national progress-control by using unbalanced annual surpluses and deficits. It had the initial effect of artificially speeding-up (or slowing-down) the amount of macro-economic activity. Keynes preferred the fiscal methods given above, particularly the open-market operations. After these methods were introduced in the US and Britain, some degree of success was initially achieved. However, the Keynesian Multiplier and its associated "pump-priming" action were found neither to work in practice nor to produce the desired effect, during the subsequent governmental monetary response to economic depressions.

An alternate Keynesian monetary method for the GOVERNMENT to control the expansion or contraction of the macro-economy (by adjusting the quantity of money in circulation), is for it to modify the limitations on the advancement of credit from the commercial banks. The action changes the proportional amounts of the total money saved, that according to the law or custom, are nominally held as reserve-deposits in the vaults of these banks, as a hedge against a sudden "run" of withdrawals. When the rate of money being withdrawn (or issued) is moderate, then the interest rate self-adjusts (followed by small changes to the Prime-Rate), together with either the shares in public companies or the bonds attracting the greater amount of new investment, see Table 14 on next page. But when the sums of money entering or leaving circulation are more significant, then either inflation or deflation is the result, regardless of any minor adjustments to the Prime-Rate.

15.3.3 Free-Market and Monetarist Policy

After recovery from the war years, the U.S. and British macro-economies progressed well using Keynesian control with the nationalization of heavy industry due to left-wing policies. But later these macro-economies suffered from recessions during a number of business-cycles. The political power swung to right-wing governments and some stronger monetary methods were subsequently introduced.

During the Regan and Thatcher eras in the later part of that century, the Prime-Rate was set comparatively high, but it was done with (fiscal) attempts to lower direct taxation so as to stimulate activity in the free-market economy. National spending on public services was cut, credit controls were reduced, whilst the amount of currency was increased and some of the nationalized industries were sold, allowing the public to become share-holders. However, inflation rose so much that any beneficial effects from the less constrained monist policy were masked by this change. This policy was not regarded as

being successful and it resulted in a large increase in the National Debt, the effects of which are being felt to this day. The gap between the rich and the poor widened.

TABLE 14. MONETARY CONTROL–CURRENCY BEHAVOUR			
MACRO-ECONOMIC CONDITION		SLUMP, Trade-DepressIon	BOOM, Trade-Expansion
Currency Natural Trend of Demand		Reduced, to Deflate	Increased, to Inflate
GOVERNMENT Stabilizing Role, (To Oppose the Trend)		Need to Speed-Up (or to Stimulate Activity)	Need to Slow-Down (or to Deter Activity)
Policy Effect	Rate of Interest on Bonds e)	Reduce and spend more	Increase and save more
	Total Amount of Currency f)	Print and Issue (as subsidies etc.)	Withdraw and Store or Destroy (Impractical)
	Bank-Deposit Reserves g)	Reduce and spend more, (greater risk to Banks)	Increase and save more, (Banks don't need it)
Affect of Policy on:	Interest Rate for Small Changes in Amount of Money	Lowered - Less Long-Term Borrowing	Raised - More Short-Term Borrowing
	Exports / Imports	Increased/ Reduced	Reduced/ Increased
	Currency for Larger Changes in Amount of Money	Deliberate Inflation	Deliberate Deflation
	Company Share-Prices	Re-gain what was Lost	Loose what was Gained
	Long-Term on Savings/Debts	Benefit / Loose	Loose / Benefit

For e), f), g) see section 15.2.2.

15.3.4 To Summarize and Conclude

It is apparent from the nature of these analyses that the control of the amount of money in circulation is not very effective a means for stabilizing the rate of national progress. This is because the macroeconomic system is more-basically stimulated or constrained by the degree of physical limitations on the production process itself, rather than by the fiscal or monetary effects. Deliberate inflation during a slump is unable to do more than temporally induce some private "panic" spending, followed by the opposite reaction of lower demand, until the wages catch up with prices. The control in the Prime-Rate on National Bonds is effective to the limited extent that it can go, but it takes a while before this effect is felt and the delay inhibits its influence until well after it is needed. In the case of a boom, the withdrawal of money leaves the system more dependent of promissory credits, which are unlikely to apply much of a brake on the rate of progress. Only high Prime-Rates are able to achieve this.

After taking the behaviour of the whole system into consideration, it is clear that the Keynesian Theory is incomplete. These influences on the degree of total activity within the system, are supposed to occur when the associated money is either "printed" or "destroyed", being effectively either emptied from the vaults of the National Bank or confined in them. However, in practice so much of the money comes from promised returns on loans that the actual total amount of currency in circulation has a much smaller effect. Some control is necessary on the way loans may be authorized. Consequently the release of Treasury-Bills between the banks and the Government, their separate credit arrangements and the monetary regulation of the credit-card companies, will have some influence on the progress of the whole system, but as to be described in Chapter 16, some other kinds of limitations are of greater significance.

None of these 3 possible government policies singly and in combination have proved to be particularly successful at stabilizing the macroeconomic system for long periods of time. This problem has never been properly understood by the various governments in political power, although a more scientific explanation and an ideal policy were known (and suppressed, see M. Gafney and F. Harrison [24]) from the time when Henry George first wrote about the physical limitations to progress, more than 130 years ago [8]. This lack of understanding may be due to the confusion between micro- and macro-economic functions that faulty money concepts induce, a matter to be further described in Chapters 16 and 17.

15.4 An Overview of Money

15.4.1 The Inside/Outside Concept

The suggestion of there being two kinds of money is introduced here and we should be careful in differentiating between their properties. This situation is complicated due to a somewhat different way of considering these two kinds of money, which recently has received attention in monetary circles and is called "inside money" and "outside money", see R. Logos [59]. Although the difference between the two kinds of money in our explanation below is similar, to see how our kinds of INSIDE and OUTSIDE money are defined, one should refer to the six entities in Figures 1 and 4. (The use of capital letters again is adopted here to indicate a simplified and idealized money category.)

OUTSIDE money is mostly in common use for business and commerce transactions and it circulates freely between the PRODUCER, HOUSE-HOLDER, CAPITALIST and LAND-LORD entities to cover or reciprocate with the supply of the various goods and services that these four entities provide and consume. Money which passes between the GOVERNMENT and FINANCE INSTITUTION only is called INSIDE money. On Figure 1 we can draw a closed boundary around these two entities to separate the OUTSIDE money from the INSIDE money. The INSIDE money is used to cover or reciprocate with the valuable legal documents that are associated with these two last-mentioned entities. However, when a valuable document passes to one of the other 4 entities, the returning category of the money payment changes from OUTSIDE to INSIDE money. Transfer money flowing in the opposite direction also will occur.

Figure 10 (on next page) is taken from Figure 4, after making suitable changes, to illustrate the partitioning of this matrix. The first two rows and columns of the square sub-matrix for GOVERNMENT and FINANCE INSTITUTION become the INSIDE money-flows and the remaining 4 rows and columns of a second larger square sub-matrix are for the OUTSIDE money flows. The two parts of the original matrix that are not included within the square sub-matrices, consist of the transfer money-flows, where there is a category of passage from INSIDE to OUTSIDE and vice-versa. If we consider particular sums of money involved, the OUTSIDE money tends to circulate at a faster rate, having been mostly spent by the end of the salary period (often of one month), whilst the INSIDE money is withheld for longer periods (particularly when the stock-exchange is in a declining state) for use when a large sum is going to be needed by the two associated entities.

FIGURE 10. MATRIX PARTITION IN THE RE-ARRANGED MATRIX

COLUMN\ROW OUTPUTS\INPUT	G	F	C	L	P	H	TOTALS	Kinds of Inputs
GOVERNMENT G	\	M	Tc	Tl	Tp	Th	GNB	Bonds, Taxes
FINANCE INSTITUTION F	rΣ(M)	\	riΣ(I)			S	FIC	Interest, Yield, Savings
CAPITALIST C		I	\	Hl	Hp	Hh	CPL	Hire-Fees, Investments
LAND-LORD L				\	Rp	Rh	LRN	Ground-Rents
PRODUCER P	Cg		Cc		\	Ch	GDP	Purchases
HOUSE-HOLDER H		rsΣ(S)			Wp	\	Y	Interest, Wages
TOTALS	GNB	FIC	CPL	LRN	GDP	Y		

The OUTSIDE money-flow was the first kind to be used in the previous analysis of the money system and its development has been fully explained in the earlier chapters. Today, this OUTSIDE money-flow is mostly in the form of deficit money, with the possible exception of coins and bank-notes, which consist of only a small proportion of it all. This is because most produces and consumers find it convenient to withdraw from the banks sums that are borrowed for a few days or weeks in the form of credits on debit cards. Promissory notes and post-dated cheques (of the past eras) also are within this category. These sums get continuously returned to the banks (and borrowed again, at least when they are on plastic cards), so that the aggregate of them acts continuously as a deficit money account, although this does not alter their effectiveness. When they are exchanged for coins and bank notes across the bankers counter, these currencies also have the same status, unless money is already in the account from where it is being taken.

INSIDE money can be considered as being independent of all the business and commerce associated with day-to-day living, but it significantly affects the progress of the macro-economy because it is what is being transacted between the banks of the FINANCE INSTITUTION and the GOVERNMENT. These INSIDE money-flows are actually dependent on the OUTSIDE money, which is more fundamental. However, the monetary and fiscal attempts of the GOVERNMENT to influence the progress of the national economy are through this INSIDE means.

15.4.2 General View of Money Progress

Consider the progress of the modern money as it passes through the system. It originates at the GOVERNMENT entity, where permission has been given for its original issue as INSIDE money. Be it in the form of bank-notes, coins, electronic impulses or promissory notes, this INSIDE money is used by the GOVERNMENT for transfer to various OUTSIDE money sources, to cover the cost of the supply of its services, as subsidies (as negative taxation), in return for redeemed National Bonds and for lending (still as INSIDE money) to the FINANCE INSTITUTION when a bailing-out operation is needed. If the GOVERNMENT wishes to stimulate the progress of the economy and to simultaneously create a degree of inflation, it releases a greater amount of this money for transfer into OUTSIDE money. When it seeks to subdue the rate of national economic growth, it withdraws some of it by offering additional National Bonds for purchase although not all of it is necessarily stored or destroyed. However there is a general tendency for the total amount, vis-a-via the National Debt, to grow. As a result, on aggregate, greater sums are released rather than these quantities being withdrawn.

The overall long-term process of the money is thus one of its being created by and passing from the GOVERNMENT to the HOUSE-HOLDERS and PRODUCERS. Then through spending and saving it goes to the CAPITALISTS and the LAND-LORDS, to eventually finish up at the FINANCIAL INSTITUTION banks where it possibly may be stored or more likely recycled as loans to the GOVERNMENT, LAND-LORD or CAPITALIST entities for further national development. Thus the assets of the FINANCIAL INSTITUTION will grow (often periodically), although the prices of the consumer goods, the durable capital goods and the value of the land will simultaneously increase too.

The activities of the banks through the FINANCIAL INSTITUTION are also significant. These institutions generally are trying to expand their assets (namely on what they can lend). This expansion is caused by the rate of interest which the banks pay on what they borrow as savings being smaller than the rate at which they charge when money is being borrowed from them, mostly by the CAPITALISTS in our model. This results in more and more money going into investment (where it subsequently returns to the bank source, after it has been used to pay the PRODUCER entity for making and providing the durable capital investment in building construction, new or better machinery, computer systems, vehicles, raw materials, partly finished goods, etc.). Although it is by this means that the banks grow in their numerical assets, the general inflation rate (which currently is small and steady in financially stable countries), means that in terms of absolute value

the banks are not growing so fast, but that certain other institutions having fixed investment are slowly declining in their true worth.

15.4.3 The Influence of the Land

The exception to this effect is due to the land. The investments are not only put into the durable capital goods, etc., but also into the land values, which increase due to the speculation in their prices. This occurs as the towns expand and their outer (development) sites become of more practical importance for both productive and residual purposes. Much of the credit that the banks generate is due to the sums that have been borrowed by the land-owners for speculation in land values. Eventually these sums will return with the interest, after the land is sold for permanent ownership and use. Unfortunately, this process is unstable and the bubble like growth of land prices will suddenly collapse.

Because of the unstable nature of this so-called "business cycle", this overall trend for progress will be regularly interrupted, about every 18 years (see F. Harrison, [60]), due to what Henry George [8] described as the adverse effect in speculation in the land values. As the land becomes progressively more costly and valuable, the amount of control as to whom has access to the growing amounts of its newly useful sites, generally becomes more limited, until a point is reached when it can no longer support the rents and values that are being demanded from or attributed to it. Then there will be a collapse in the land prices and a slump in the progress of the general economy, with a lack of work for those who have lost such opportunities, due to the failure of many of the more recently established entrepreneurs. This is the result of the speculation in the land values and in its progressive unavailability at reasonable cost. As the time passes, the slump in the progress of the national economy normally will be followed by a slow recovery and expansion, eventually reaching higher levels of progress than before.

CONSEQUENTIAL MACROECONOMICS

CHAPTER 16. VARIOUS KINDS OF SUPPLY-LIMITATIONS TO GROWTH

16.1 General Summary

Strictly, a limitation to growth would exist if its removal then allows for greater total activity within the system. This sensitive subject is often treated in a less precise manner and many of the descriptions of what constitutes a limitation do not properly meet this criterion for less restricted activity. In the following analysis about what effectively are the flow-restrictions, the style of discussion is less disciplined too, compared that previously taken and some microeconomics properties are included. This treatment is necessary in order to provide a more complete explanation of these aspects of our more slowly-changing general macroeconomics system.

From a personal or individual viewpoint, the identification of the limits to growth appears to be largely a money matter. As house-holders and spenders of the family budget, we can readily appreciate where and what kind of constraint on purchasing may need to be applied. Therefore the first part of our enquiry looks at the problem of limitations to growth from this perspective. This subjective approach implies that the money-flow limitations are based on microeconomics considerations, where the particular money-flows are isolated measures of the amount of local business being transacted. It follows that this argument fails to properly explain the cause of the limitations. More developed reasoning for and against taking this attitude form a part of Chapter 17, where its significance is prescribed as a major conclusion.

In macroeconomic terms, our limitations problem actually is closely associated with the physical trading aspects of the system. These concern the supply-variables, including those going to the PRODUCER entity and this is related to the analytic methods adopted in the earlier parts of this book. Indeed, the above expression in the title of "supply-limitations" was taken from Chapters 8.4 and 9.2, where it can be seen that the supply of goods and services may restrict certain macro-economic activities. Two of these kinds of limitations lie along the leading-diagonal circuits and the particular money-flows involved were envisaged as being the returns for the flow of the material-values. Consequently, the following physical approach takes a parallel view to that of the proposed monetary constraint, although it applies more generally to the supply of goods and services. An alternative paradigmatic view of the limiting services is also expressed—its conclusion

providing a better explanation of the kind of blockages that can really constrain macro-economic progress.

16.2 The Money-Supply Perspective

Having described money in the previous two chapters, a number of explanations are first presented here, about how the restricted flows of money might limit the progress of our social system. None of these arguments actually hold up after close examination, but without providing some detailed discussion, our subsequent biased attitude being taken toward physical flow explanations, would otherwise thought to be unjustified.

16.2.1 Money Circulation and Blockages

Consider one of the money-flows circulating within the MESS as seen in Appendix F. From a specific entity's viewpoint, a money-flow limitation in spending is caused by a prior restriction in its money income. Thus it can be claimed that the greatest restriction of flow in each circuit of the MESS is the result of there being a limited income to one of its entities, whilst the demands are exactly met by the distributed activities from within. Then each circuit would seem to have one location where the greatest flow restriction occurs. However, the subject of a single money-spending constraint is complicated, due to the flows that arise from the need for the same entity to satisfy money demands elsewhere, because nobody wants to hoard money and to (unnaturally) restrict its use and circulation. By working away from the locations of the possible restrictions, it is seen that these money-flows are parts of a widening series of activities. They also lead away from the more-definitive arguments or easily derived explanations about why and where the limitation actually occurs. Indeed, by the use of this approach it is impossible to establish the specific underlying cause of the blockage. More generally, we find that the monetary equalization of individual supply to demand is incapable of determining the changed amount of macro-economic activity due to the influence of the limitation. (On a microeconomics scale, the use of this principle enabled G. Debreu [51] to find the amount of business being transacted in various production sectors. But his argument required the making of assumptions about comparative prices within the PRODUCER entity, and it badly lacked the more general proportionate allowance for the use of all three factors of production.)

Then it is incorrect to claim that a single kind of restricted money-flow necessarily constrains the whole system. In the numerical examples 2, and 3

of Chapter 11, two opposing effects were examined. In example 2, the effect of increased personal spending after the GOVERNMENT entity cuts direct taxation was shown to reduce the total amount of macro-economic activity. Whereas in example 3, the whole system becomes more active, after the amount of personal spending is cut, due to this entity raising the tax burden. Both these overall responses are contrary to the money-flow restriction proposal, as conjectured above. Then this claim of a reversal of performance is due to the subjective attitude taken by the taxpayer, without fully allowing for the changed activities in the rest of the system, see also H. Hazlitt [19].

Arising from the concept and use of aggregate values in our macro-economic analysis, it might appear reasonable to express an average money-flow rate as having reached a tangible boundary. But due to the varied ranges of goods quantities and services in demand, and the somewhat greater efforts and higher prices that entrepreneurs and their customers are occasionally willing to expend, the trading actually becomes progressively reduced, without completely shutting down and this kind of limitation also appears to be indefinite. Also there are alternatives within the system, where substitution between the flow-quantities is possible, after having taken a decision against a specific one. Consequently, many of the aggregate forms of behaviour of the entities are not constrained by rigid physical boundaries and their limits are elastic and progressive by nature.

The results of the equilibrium-seeking money-flow effects described in Chapter 8, should not be confused with these kinds of limitations. Although the system is trying to reach a condition where certain amounts of entity participation are required, this is not a limit in the same sense as that being examined above. Equilibrium-seeking is related to the whole system, the decisions of which have more balancing than substitution operations (see Chapter 10). Its process is not constrained by any specific part and after sufficient time-slices have passed, any particular amount of progress is possible. These equilibrium-seeking effects result from the basic macroeconomics process, whilst the limitations to the system are better explained in physical terms, namely by the 3 factors of production, which is not directly dependent on the money-flow situation. Let us continue to examine some other financial issues.

16.2.2 The Effect of Deficit Based Finances

It is a common style of economic behaviour to borrow as much money as one can and to accumulate a semi-permanent debt situation. By this means it is possible to have today what presumably will be paid for tomorrow. Much of the effective value in durable capital goods and in land-values too, is the form

of owed money and our society operates in a continuous state of heavy deficit. Due to the return of interest on loans, the banks are strongly motivated to extend credit, even where it is less prudent for them to so do. Then the refusal of additional loans might be seen as another limitation on the progress of the macro-economy, although this trend is ever-present, depending on the creditor (see Chapter 13.4). Against this claim it should be pointed out that the prior extension of credit and the resulting greater amount of spending and investment have already enabled the macro-economy to advance faster than it otherwise would have done--having raised the rate of productivity, which is beneficial to the whole community. This partly justifies the policy of deficit-based finances. Borrowing then appears to have reached a credit-saturation level, where no further loans from the banks are possible (without unreasonable rates of interest being charged), before some of the previous loans needing to be returned. (Even so, other kinds of borrowing are still possible, see below.) Should the borrowed sums be returned at a slower rate than the new credits are needed by borrowers, there is no justification for opposing this responsible attitude to loans from the banks. However the non-availability of additional sums is insufficient reason to blame for a restriction in the macro-economic activity.

Since some of this credit is continuously returning (and then becoming available for further use), the system actually functions in a state of continuous "deficit-stress", which gradually grows but does not constitute a money restriction in itself. This is because the interest on the debt which the banks accumulate, adds to the sums available for new crediting. Due to this and to the effective increase in total debt, it is impossible in practice for a deficit-based economy to be further restricted by the saturation in the available money for new investment. Although in times of economic depression, there is a strong tendency to blame the finance institutions for the slump in share values (actually due to lowered dividends), there is no strictly logical reason why such an accusation is justified. A discussion follows of an additional claim relating to a money-flow restriction.

16.2.3 "Barter-Value" Blockages

Another way of explaining why this monetary limitation approach doesn't apply in practice is that a shortage of money does not necessarily cause a restriction in trade. The purchaser may temporarily create money by the use of time-limited contractual promises and guarantees (regardless of cheques and credit-cards) and the business-activity will continue to flourish. The time-limit on this applies only in the microeconomics sense. In macroeconomics the magnitude of the giving this type of credit depends only on the capacity of

the system to supply goods. The basic principle of goods-exchange by barter (Chapter 13) is still effective, it being expressed in physical or material promissory terms rather than in monetary ones, by J.W. Hutt's explanation that "supply creates its own demand" [6], which was how D. Ricardo interpreted J.B. Say's original Law of Markets.

The simultaneous returns for the use of the three factors in the production process, namely the wages, hire-fees and ground-rents, already exist in the value of the goods once they are made and they are recovered when the goods are sold. Arguments against J.S. Mill's Wage-Fund Theory [52], see H. George [8] and F.D. Longe [53], both of which deny the truth of this concept, are presented in section 16.6 and Chapter 17.6.1. Due to the effect of competition, commercial transactions ideally take place at the lowest price for which trading is worthwhile, whilst being limited solely by these three production costs--any excess being shared between their sources. Consequently, they depend on the physical constraints of the system and not on the monetary ones. Therefore we need to look elsewhere for the basic cause of the supply-limitations.

16.3 The Goods Supply Perspective – The Direct Involvement of the
                                                                    PRODUCER Entity

Fortunately (at least from an analytically motivated viewpoint), the money-flow aspect of the problem becomes a secondary consideration, after a bottleneck has been experienced in a circuit for the supply of a particular kind of physical quantity. Instead of re-tracing the money-flows back around the system as outlined above, the materialistic counter-flows to produced goods (namely the availability of usable land, suitably skilled workers and durable capital goods over a period of time), can better determine the physical limitations. Valuable legal documents also flow contrary to the money and they are included below, although their nature is not of such a directly physical-acting kind.

Apart from the PRODUCER, the other entity whose output activities might be supply-limited is the HOUSE-HOLDER, see Figure 4 (Chapter 9.3). In the HOUSE-HOLDER'S situation, a reduction in the supply of durable capital goods, access to residential land or in the use of consumer goods (the corresponding returns being **Hh** , **Rh** and **Ch**), are unlikely to affect this entity's sole output activity--that of labour. This is because the return is exchanged for wages, which do not cease after one or more of these "home-consumables" has been curtailed. With the greater freedom of choice compared to the other entities (due to a wider range in competitive goods), the material limitations on which this entity can reasonably manage its affairs,

are not strongly felt. Thus **Wp** with **Ch** are actually bartered exchanges of this entity, the money acting as the intermediate means for doing business. This also implies that the money-flows are not the basic cause of the problem.

More to the point, it is the supply of materials to the PRODUCER, which can cause the bottlenecks. These materials are the result of prior production, so that when considering the aggregate production process, the materials (originally having been extracted from the land) are already included. As seen in Figure 4, this entity brings together the three factors of production, namely the access to land (and other natural resources), the employment of labour, and the use of durable capital goods. Since a stable entity condition does not allow for much growth within a time-slice, it implies that at least one of these restrictions in the supply of a factor has already been reached. These limitations also affect the process of achieving equilibrium, by their influence over the decision-making ratios. Consequently the directions of development of the macro-economy can be severely restricted by the expression of one or more these three limitations in growth.

It was previously seen that double-sided decision-making applies only to the PRODUCER, which uniquely controls both the output and the input money-flows associated with its actions; albeit these 2 kinds of flows are basically determined by the demand for goods. Examination of Figure 1 and the list of possible circular money-flows in Appendix F, show that the only truly significant physical limitations in the system are from the unavailability of one or more of the three factors of production. These physical supply-limitations are expressed in terms of the corresponding money-flows, which are the returns for their use. They are the ground-rents **Rp** , the wages **Wp** and the hire-fees or yields **Hp**. Two of these flows (**Wp** and **Hp**) are from leading-diagonal circuits and they have the most immediate influence on the multiplier-effects. **Rp** has a longer lasting effect on the rate of production, see the next section. By their restriction these more-direct effects can suppress the MESS activities, opposing the small benefits that the multipliers would otherwise confer (see Chapter 7). Consequently, it should be no surprise to discover the emphasis given by the Trade Unions and their counterparts the Manufacturer's Associations to the variation of wages and produce-yields, respectively. Whilst these money-flows are good indicators of the causes, they do not actually comprise the limitations themselves; it being the withholding of unused land, the lack of coordination of adept labour or the inefficient utilization of durable capital goods that can slow the operation of our system.

A point of interest is to determine the places where these three indicative restricting flows (**Rp** , **Wp** and **Hp**) occur in the lists of circular flows in Appendix F. At an arbitrary moment in time, calculations for the distribution of these three factors over the region of the MESS of concern, can provide us with details about the limiting effects caused by their supply, see Table 15, which is adapted from the summary table at the end of Appendix F. It is seen that the use of land is 71.5% as significant as the most serious effect of labour (100%), whilst the durables are only half as much so. The money-value returns on these 3 factors are not necessarily related in the same numerical way, but the relevance of land compared to durables is clearly apparent.

TABLE 15. NUMBER OF OCCURENCES OF THE THREE MONEY-FLOW RETURNS FROM THE PRODUCER ENTITY			
NUMBER OF ENTITIES IN THE CIRCUIT	MONEY-FLOW RETURN		
	PRODUCER'S Ground-Rent **Rp**	Wages **Wp**	Hire-Fees on Durable Capital Goods **Hp**
6	3	2	1
5	4	4	2
4	1	5	2
3	2	2	1
2 leading-diagonal	0	1	1
TOTALS	10	14	7

Of the 46 money-flow circuits, these three kinds of flow appear no less than 31 times. Each return from the PRODUCER occurs once in any single circuit. This is a feature of the system's topology, whose regimes are affected independently by the entity-control of each kind of function. After the macro-economy has grown to a useful size, these independent controllers will logically decide on the relative (optimum) amounts of their significant participation. Consequently and by implication, these limiting choices are made in a comparatively simple manner, the 3 flow effects themselves not being inter-related.

16.4 The Paradigmatic Approach to Growth Restrictions

This subject of physical supply limits is approached differently in the graphic description of a growing community, as presented in Appendix E. Here we examine the various stages in the development of small pioneering

settlements into great cities; the gradual transformation of the homestead communities into the well-founded citadels of macro-economic power.

During the pioneering stage, the contribution provided by an experienced worker is scarce and labour is such a highly-valued resource, that even unskilled hands are eagerly sought. New communities that plan to grow fast need to surpass this limitation by investing in a training-programme to enable them to competitively support themselves. Subsequently within the small community, the physical limitation is due to the unavailability of basic durable capital goods such as suitable buildings, tools, machinery and transport, especially when the new activity is one that has not yet seen much local development or is innovative to the region. Finally after this physical obstacle also has been overcome, further growth is inhibited by the rise in land prices, due to speculation in its value and partial withholding of its availability. Thus whilst being expressed differently, these three kinds of limitations are effectively the same as those presented in section 16.3.

In the case of the natural resources, the farm-lands are dispersed outwardly from the centres of population. The more remote farms have the greatest transport costs, so the non-use of land lying even further away implies a boundary beyond which agriculture is not worthwhile, as first described by D. Ricardo [4]. These poor-lands are said to have less than marginal utility, for this particular type of comparatively low-value produce. The same kind of limitation applies to the opportunities provided by more-valuable commercial sites that are closer to the centres of population. Should a business be located near the edge of town, it will attract but little trade, due to the unsuitability of its position for the necessary rapid communications. In the same manner, with increased distance from the city-centre, the residential land-value diminishes, due to the practical need for the trained workers to live within a reasonable travelling distance from their work-places and from the shops, schools, health and entertainment centres, social clubs etc. The related subject of land-values is described in detail in Appendix G.

To some extent the PRODUCER entity is able to substitute one of these variables for another, but where there are significant differences from the ideal proportions of these factors of production, then the upper cost limits are quickly reached or the output soon drops below a worthwhile quota. Therefore the returns that this entity pays are limited by the incoming availability of one of the necessary factors, natural resources, man-power, and durable capital goods (and associated services). In particular it is the limitation on the availability of useful land and other natural resources that has the greatest effect on the growth of the well-developed macro-economy.

Companies who own the land on which their factories are sited do not normally separate the ground-rent as itemized credits and liabilities. The effect of land ownership by the monopolists is neglected, in their system of double-entry accounting statements. Strictly, the ground-rent should appear on both sides of the balance-sheet, but it is usually forgotten. Were these companies legally obliged to show the ground-rent and were its magnitude to become public knowledge, then there would be greater awareness of the extent and significance of land monopolization, its improper withholding, its associated waste and the degree of speculation taking place in its value (see H. George [8] and others); the distribution between the three factors of production costs more closely resembling that shown in the previous section.

Over the years, the actual ground-rent **Rp** will increase due to land scarcity (possibly including the adverse effect of speculation in its value), making it more difficult for competing firms to establish themselves in the same region. However, this change occurs with the previously established (monopolistic) companies neglecting it from their annual account-sheets. Even when this ground-rent is included, it is disguised as a fixed return on investments. By means of the limitations caused by the occupation of the land, a form of political control has been introduced against free competition. Limited land availability throughout the MESS means restricted opportunities for progress-- it results in extravagance in riches by the few and unemployment for the many, the latter often coupled to the unhappy, squalid conditions of poverty. Monopolistic action is also described below.

Against these bounds, the forces of competition press and the captains of industry continuously seek better ways to exploit new inventions and discoveries. Consequently, the development of technology without the monopolies suppressing and controlling the market could result in a wide-spread and more uniform distribution in the use of the three factors of production. It would enable their supply-limitations to gradually relax and for the economy to become more diverse, as its efficiency rises and its production costs fall. The resulting decision-making depends directly on the permitted amount of commercial freedom. The improvements that are expected to occur over a long time-period are due to the progressive reduction of these restrictions. Thus, these limitations are seen as basic characteristics of the earlier system, whilst their reduction is a desirable policy for the encouragement of progress in a well-governed and efficiently run country. Their absence is not merely the happy result of good control over some of its ancillary aspects; any kind of artificially imposed limitation on the three factors of production is continuously harming the whole system.

16.5 The Nature and Cause of Unemployment

Surely the greatest scourge within our social system is the way that unemployment affects, the lives of many workers and their families in both physical and psychological ways. This problem becomes especially acute during the "negative prosperity" parts of the business-cycle. The cost of imported raw materials is not fixed and fluctuations due to this, unreliable climatic conditions, technical developments and trade-union strike-action, all can somewhat influence the rate of progress of our society. However, having eliminated the claim about a general money-flow restriction being the cause of the slow-down of the system and having described the ways in which a community grows into a large and developed metropolis, with much wealth in the hands of certain small sectors of the community, it should already be clear where lies the major source of the restriction on this kind of macro-economy.

Although some of the above-mentioned changes in local and foreign conditions apply, the greatest restriction is due to a reduced demand for goods and this is the directly result of a combination of comparatively high prices and the lack of opportunity to earn a living. Both these effects are associated with the control that monopolies have in the production facilities and how in particular the land owners exert their influence (through its management) on the landless working population. When some of the useful land is held out of use for purposes of speculation in its value, the competition for what is readily available causes the ground-rent to be raised. In turn, this increases the production costs and the prices that are charged for the produce. The raised prices, whether for consumables or durables, result in a slower rate of use of the goods and their diminished demand. This slows production and consequently restricts the number of employed workers. Since land is needed for producing any kind of goods (it being one of the three Smithian factors of production [3]), its high cost of access has the effect of constraint on the entrepreneurs, of sufficiently worthwhile opportunities for starting up new businesses, so that their activities might otherwise compete fairly with the well-established and monopolistic conglomerates.

16.6 The Proposal for Governments to "Create Jobs" and Ease
Unemployment

It is sometimes thought that the creation of jobs can be achieved by governmental control of the way that the national income is used. This concept, which was suggested by J.M. Keynes in 1936 [42], makes the assumption that the Government can stimulate the macro-economy. He claimed that during times of economic depression or slump, greater activity should be encouraged by use of part of the national income to provide for more jobs. This would relieve the amount of unemployment and start the process of money recirculation, as when a water-pump is primed by first pouring some of the liquid into it. In adopting this approach, the un-stated assumption is based on what H. George and F.D. Longe call "The Wage-Fund Theory" [8], [53]. In other words, by implication (and imagination) a special fund or new source of national monetary income apparently is needed, before the additional workers can be employed and their wages paid.

Since the produce of this labour is readily available for viable commercial trading, then as H. George and F.D. Longe point out, no wage-fund is necessary. This is because the value of the produce (or the greater value of the land, when improvements to its infrastructure are being made), correspond to the total returns due to use of the three Smithian factors in production. These returns are in ground-rents, wages and interest or dividends on shares of the investment, after the respective production activities are performed, namely the access-right to suitable sites, the exertion of labour, the use of buildings, machinery, vehicles, etc. For a proposal that is has good prospects, a loan is normally obtained or shares distributed and sold. This credit for investment in durables is gradually returned with interest, as the rate of production grows and the product successfully marketed, without the need to begin with a large starting-up fund for paying wages (nor for that matter for renting land, returning interest, etc.).

However in the case of the Government, the results of the national projects being executed are not immediate, nor are they necessarily tangible. In this case the particular kind of "created" labour is unlikely to produce anything that is directly saleable and the need for a continuous wage-fund or an alternative rate of income becomes necessary. Even if Keynes's pump-priming theory were correct, the money must be taken from somewhere and consequently the national economy would be affected in some other manner and its pumping effect withdrawn elsewhere. Our broad view of the whole system shows that this is inevitable, there being no "free-lunch" see C. Bazlington [54], although Keynes apparently claims that it does exist for Governments. Were this additional labour used to improve the infrastructure of the

200

community, such as better roads, water and electrical supplies, drainage, social and emergency services, public health, education, satellite-communication, etc., then the returning wages etc. for doing this should be taken from a new source of expected return, due to the improved land value.

In Keynesian Theory, this money must be obtained by making adjustments of the national income. However the full implications of this are not properly examined by Keynes, although he vaguely suggests that it might better come from savings. Without a more complete analysis of the effect on the other parts of the social system, H. Hazlitt [19] has shown that the implications of making changes to achieve this or other noble ends, result in an incomplete picture being so obtained. This is unsatisfactory. From the description in Chapter 15.2 there are but three traditional ways that this additional national income and change can be gained. These are, either by taxation, by governmental borrowing or from inflating the currency after issuing more bank-notes. The effects of making each of these policy changes were detailed in the previous chapter. They are briefly reviewed here.

When more income or purchase tax is gathered, there is less money available for use by households in their purchasing of useful consumer-goods and for their investment in durables. This results in a lower demand for the produce by these home-makers, whilst the wages of the new government employees cause their consumption to rise. Consequently, the effect of the tax is socialistic. It merely takes some of the money that was paid to the previous house-holders and redistributes it instead to those who are newly employed. This has but minor effects on the whole macro-economy. Even if the average wages now being paid are lower than before and as a consequence, a greater number of persons are now employed, the total demand for consumable and durable goods is virtually unchanged. Depending on the current tax regime, with some additional employees receiving lower wages than before, the gathering of less income-tax is likely, since the amount being collected is usually non-linear with the amount of personal income—an arrangement intended to ease the tax burden on the least well-paid part of the community. But the total rate of money circulation, spread amongst all the employees, is still the same. The short-term transitory effects of these tax changes are less uniform and this was illustrated in Chapter 11 and Appendix D.

The alternative of advancing bigger sums of money to the Government by the banks and savers, means that less credit is available for use by the industrial, commercial and private sectors of the community. These kinds of investment are reduced and along with them less employment is needed to make the

associated durable products for use. Again, this job loss balances what is currently being gained from the Government's "creation" of the new jobs. There is no overall benefit to the community and when the interest on these loans is included, the banks gain whilst the tax payer sees less for what he provides, due to some of it being used to cover the interest.

The evils of currency inflation have already been explained. This has a number of dynamic effects some of which were previously claimed to be beneficial and for a limited period more employment does result, see A.W.H. Phillips [15]. However, after the effects of inflation have raised the prices of goods and when the savers find later that they have reduced spending-power (and the debtors subsequently have an easier time repaying what they owe), the overall effects of using this less useful money for job creation is not beneficial to the whole macro-economy, when taken over the long-run. The claim of pump-priming by J.M. Keynes [42] as explained by J.R. Hicks [14] is incorrect, due to the incomplete picture presented and implied by his model. The mutual flows of money and goods do not multiply over time in the manner that he prescribes. They have already become multiplied during the continuous process that was explained before.

The improvement to the infrastructure raises the value of the land, due it becoming more productive. This benefit encourages the land owners to speculate in the value of their sites and to withhold some of them from use, whilst the competition for the remaining ones rises in intensity, along with the land prices and the ground-rents. These effects result in higher production costs, less demand for goods and greater unemployment. Consequently, after the effects of making this national money adjustment are included in the analysis, it is seen to be impossible to create certain jobs without the elimination of others. The benefit to the community of a government taking this policy is very much in doubt. The imposition on the progress of the economy actually comes from the somewhat delayed effect of more costly land. Only after the land prices have fallen during a slump, or from the secondary effect due to the introduction of land value taxation, see Chapter 11, example 4 (instead of the burden being placed on production and produce), that a greater long-term incentive for access to land can be generated. Then the resulting better job opportunities eventually will enable some real progress to be made.

CHAPTER 17. RECOGNIZING THE MACROECONOMICS PERSPECTIVE

It is important for the student who wishes to fully appreciate the nature of macroeconomics, to be able to discriminate between the micro- and macro-properties of the general subject. In writing this book the author has dealt specifically with the large-scale or macro- effects of our sociological system. He has mostly avoided the finer-scale features of microeconomics. However, the number of misunderstandings between these two kinds of effects continues to abound in the literature. Both of these reasons prompt the author to include this additional and concluding chapter--to summarize and further explain where these differences occur and to show where they are to be found in this work.

Regarding the general approach to our subject, some stipulations must first be made. In particular, the two assumptions of Aggregation and Idealization (Chapter 3) are needed in order to specify the domain for our subsequent theorizing. These twin concepts are a logical step in our approach to the macro-economic variables of interest. The instigators of the other kinds of data-driven statistical (econometric) models have never properly appreciated this, nor have they found the need for building on this foundation an over-viewing macro-kind of theoretical science. In their approaches to macroeconomics, no difference is seen between the input and the resulting behaviour, which are often taken together many times over, whilst the functional process itself is often neglected or incomplete.

Our current overview uses a model that represents the social system set-up in a logical, functional, comprehensive yet most-simple form, which deliberately excludes many unnecessary complications. However in this theory, a significant part of the rationale comes from an idea initiated by Henry Hazlitt in his pragmatic approach to the "One Lesson" [19], to include the necessary additional and related effects. It is further developed here. Consequently, these analyses have a number of unique features, which have not been properly expressed in many of the previous kinds of descriptive macroeconomics, even without the more exacting theory.

17.1 Logistics of Modelling the System

17.1.1 The Effect on the Model of Making Assumptions

This approach and initial stipulations/assumptions as applied to theoretical macroeconomics seem to have instantly provided the subject with a will of its own! Then the author finds himself unable to avoid following the particular modelling technique being employed here, which is similar to but an extension of that used by other writers in this field. This is not the same situation as in microeconomics, where there are two independent variables at most and one that is dependent. There, only a few equations or the intersection of two representative curves are sufficient. In microeconomics, the assumption that all the other quantities are fixed, known as "*ceteris paribus*", is acceptable. However, in macroeconomics and in common with other multi-variable problems in engineering, this assumption is inappropriate and a model is needed that can adapt to simultaneous changes and more complex effects.

17.1.2 The Nature of the Entities and their Ability for Providing Collective Properties

In contrast to this complication in our modelling, the specific nature of each entity is separately represented by its various unique functions, both in isolation and in conjunction with the rest of the system. This organizational feature has the advantage of being capable of independently and completely representing all of the functions, without needing to incorporate the more-detailed specialization of each kind of company or trade, even where many of these basic functions are combined.

It is by this means that the collective properties of the entities are seen to be significant. The example of the LANDLORD'S activity on their entity and the process of land ownership and exchange have been already described in Chapter 3.3. This separates the micro-activities from the more significant and profound macro-ones, where the prices of sites in the whole region are raised, due to news of governmental plans to build a new major road, bridge, harbour, railway etc. Such a decision will not only raise the value of each site that is close to the new installation, but it will reduce the general cost for the transport of goods in that greater district. Here too is a case where the avoidance of the sight of the "trees" helps us to better appreciate the contribution of the greater prospect, which the "wood" portrays.

In addition this model allows for the introduction of additional entities (or for certain of them to be removed), without greatly disturbing the operation of the

rest of the system. This feature is shared with simulation models in many other engineering dynamic arrays, so that for example, after a sudden engine-failure on the wing of a multi-engined aircraft, stable flight is restored, after the resulting yawing-motion has been properly subdued.

17.1.3 Time Effects

Initially the flow-rates were regarded as instantaneous quantities that are in a state of equilibrium whenever they are examined. However, the introduction of the time-slices and exogenous change between them modifies our concept of the model. The flow-rates then can find their equilibrium values endogenously within each time-slice, by rapid self-adjustment, provided that the slices are thick enough for this to develop. Also, it allows us to envisage the flow-rates within each slice as having time-averaged values.

The exogenous changes between the slices permit a flexible means for representing the dynamic system as a whole (and in part), the use of Occam's Razor, see A. Baker [23], keeping the number of slices to a minimum. An effort was made to avoid the use of a more complex model which would function at different heretical levels. It would be likely to confuse rather than to help, in our understanding about how the whole system works over the short-term.

17.2 The Duality of Purpose and of Activity Within the System

17.2.1 The Paradoxical Macro-Economic Aim

The Georgist axioms as summarized in Chapter 10.5, state that man aims to gratify his unending desires, with the least amount of exertion. These two apparently conflicting opening-assertions of greed and laziness, when taken together in the true dialectic philosophical manner, express the execution of the combined and full economic process. Thus from the first glimpse of this subject, it is apparent that a kind of oxymoronic feature of its behaviour is necessarily indicated. This dual or reciprocal nature is expressed throughout almost all of the macro-economic theory given in this book. In microeconomics theory these two axioms are not applicable to individuals in the manner as envisaged above. Our personal desires are finite and our private exertion is frequently more than the minimum, since the various arts, crafts and sporting activities are often pursued to bring us pleasure, without necessarily providing us with a living.

Apart from Nature, duality is almost unique to (evolutionary) macro-economics. The sole exception in microeconomics is in the supply and demand for goods, which are expressed graphically by two kinds of curves that relate their quantity to their price (for example in Figure 9, for a macro-case, where the "goods" take the form of money). This part of microeconomics is dualistic too--the two kinds of economics overlapping, which causes much confusion. Unlike the rest of microeconomics theory having its cause followed by an effect (in one direction), our macroeconomics subjects always bring together the result of pairs of opposing human purposes and attitudes, to yield a kind of "Hegelian synthesis", homeostasis or consequence, for the manner by which progress is made in our changing community.

17.2.2 Democracy and Two- (or More) Party Politics

In the representation of the community within a democracy, it is usual to have two or more opposing political parties. This arrangement results in a compromise of the national laws and behaviours. This is regarded as satisfactory, although the passing of a specific (micro-) law often favours the needs of only a minority of the population. When more than two major political parties exist, the creation of a national all-party government is rare. Instead a coalition is usually formed, the compromises between certain political parties permitting a limited degree of bi-sided government.

If there is no opposition to the Government, a monopoly or dictatorship develops, which theoretically favours only one class of citizen and society (except for those in control). This social stereotyping is regarded as being morally unjustified within the freedom-loving multi-cultured complex communities that are usually present in the Western world.

17.2.3 An Analogy to Mutual Circulation Within the Big-Picture and the Implication

Just as many pairs of clapping hands are needed to create the sound of applause, so too inside macroeconomics, it is impossible for only one kind of reciprocal transaction to fully activate the social-system. In our comprehensive modelling for the minimum number of types of exchange contained within our macro-economy, a total of 19 different kinds are found to be essential. Each consists of two types of circulation between the various entities. The barter-like transfer of material goods, services and valuable legal documents pass in the various specific directions, whilst the money returns along all the opposing routes; a picture resembling the "round-table" barter situation, as described in Chapter 13.2.1. These bi-directional pairs of flows

have equivalent value. The profit motive encourages these activities to take place, since both entities independently find the exchange to be worthwhile. This is paradoxical, since in macroeconomics it has been previously shown that the money-flow term for "profit" exists only in the mind.

Emphasis has been given here to the physics of the circulation, because even before money came into use, the basic system with barter has the same theoretical basis for its operation. Within the business-machinery of exchange, money is thus seen to be acting also as a working fluid which can be cleaned or changed when its use becomes inefficient. The history of money in Chapters 15 and 16 bears that out.

Taking an over-view without directly equating these mutual flows, we can also regard both the physical and the currency circulations as being independent. Durable capital goods, site-potential for production or residence, labour-capacity and valuable legal documents, the physical items in the system, may flow and accumulate unused in certain places (Table 5). But to keep the business moving, there is also a steady generation and enjoyment (by gratification of desire) of these diverse kinds of consumer-goods, useful services and valuable documents. On the opposite route, the money-flow is continuous, but unlike that of the durable capital goods, etc., there is no advantage in withholding large cash accumulations. Except for the convenience in having some money in hand and the apparently necessary bank-reserves, everyone wants to be rid of it as quickly as possible and then to make best possible use of their purchased goods, services, shares, access-rights etc. Indeed this situation is so acute that deficit or credit-money is readily obtained (and available) to help speed the rate of business activities. This implies that any growth of the system will occur, as of necessity, the promissory form of credit is extended. Consequently the material limitations in Chapter 16 are one-sided. Here are situations where physical micro-economic effects apply to the macro-system, to include the choices made for the remaining unconstrained activities of the MESS.

Without entering into the complications of social growth (or shrinkage), price-inflation (or deflation) etc., money is neither created nor destroyed in the short-term model. This means that logically there cannot be any overall money-multiplier in a stable macro-economy. The Keynesian Theory claims the potential for this multiplier-effect to exist, even when the system is steady and more money is being saved than withdrawn. However, the limited model that it adopts for use does not consider the return payments on borrowed promissory credit. They are implied, but by ignoring these future payments this theory apparently creates something from nothing.

The fully-comprehensive short-term equilibrium model, which is used here, does not deny multiplier-effects, but they are very different to the Keynesian kind. A number of multipliers of the money-flows that exceed unity are shown to occur in particular variables, see Chapter 7. However after modelling the whole system, the effect of the money redistribution causes other multipliers to be less than unity. This applies to sociological progress (synthesis) within the time-slice, without fiscal growth. Between these periods, such growth can be introduced exogenously by promissory credit, although these changes lie outside the scope of most of the present discussion.

17.2.4 Adaptation of Say's Law to Macroeconomics

Continuing with the hand-clapping analogy, in microeconomics it is better to regard as foremost the hard-won goods-values etc., (provided by the striking-palm) and its reaction by the tempting offer of its exchange for money, (as the resilience from the opposite hand). This situation may be explained as the physical-supply calling for the money-demand, which agrees well with David Ricardo's version of Say's Law, namely that "supply creates its own demand"*. The money reserve principle, as described in Chapter 13.5.5, supports this claim too, since the multiplier is not instantaneous in its effect.

However, in macroeconomics the detailed situation is somewhat different. Basically, the mutual flows represent the supply of goods, services and valuable legal documents whilst the demand comes from the money-flows and rates of interest. A. Marshal [9], claims that supply and demand are equal, so each pair of these mutual flows provides an intersection point on the supply and demand curves, as previously described (as in Figure 9 of Chapter 13), but for price replacing "rate of interest" and for quantity of goods instead of "money". But after taking more of the big-picture into account, the effects outside of each relationship, between these specific pairs of entities, also play a role and they drive this equality into a different point of super-position. Consequently the supply and demand curves move up and down (varied prices), to eliminate surpluses or shortages.

---

* The full explanation of how Jean B. Say's so called "Law of Supply and Demand" was derived from his "Law of Marketing", including David Ricardo's asymmetric interpretation, is provided by W.H. Hutt [6]. This modification was further simplified by A. Marshall [9] and later adopted by J.M. Keynes [42] for use in favouring his supply-side theories.

Then the quantities of goods and services being produced vary, so as to accommodate these ideal intersections. This is expressed here by means of the decision-making ratios, where the incremental flows of both money and goods need to be accepted into the system. (However, not all of the decision-making is optimal nor exact, due to the need to include some more-complex effects, see Chapter 12.4.) Depending on the circumstances either the goods-supply or the money-demand are the instigators of this local activity. This nicety of detail complements the somewhat cruder macro-approach taken earlier in this book, where supply and demand are simply set to be equal and opposite.

17.2.5 Dualism in Decision-Making

The kind of decisions being made (either by balancing or by substitution, see Chapters 9 to 11) are of a dual nature, as well as much of the decision-making itself. Table 8 in Chapter 10 makes the "either/or" logic of this process very clear. Although the adjusted flow-quantities are dependent of the decision-making ratios, the actual need for making the various choices and many of the choices themselves are based on both the nature of the disturbance and on the place where it is being felt. Without this dualism being an intrinsic part of the macroeconomic system, the activities would have no consequence beyond their immediate effect and they would be micro-economic in nature.

17.3 The Paired and Multi-Paired Attitude to the Macro-Economic Variables

17.3.1 The Double Definitions of the Variables

Dual status is not confined to where the features are found, it also applies to the nature of the variables themselves. All of the quantities used in macroeconomics theory require double definitions and meanings, many of which relate to both the provision of and the need for their subjective values. Exacting kinds of people have difficulty in defining a variable in two different ways, it being thought of as imprecise. However, unlike simple micro-economics situations, this approach is both fitting and necessary for our representation of the variables of the system (and it is acceptable since the two results must work out to be the same in practice). In Appendix B, all of the 38 cases of these definitions are provided.

This parity is due to the nature of the subject being examined, it being of a macro-kind. Our system collects together a very large number of personal

and sensibly directed compound activities and sorts them into opposing (input/output) paired functions that are executed by the small set of idealized role-playing entities. These functions are then considered to act as if there was a similar group of simplified logical reasons for their average performance. In order to place this correctly within the scene delineated above, one needs to employ pairs of definitions which appear to be in opposition, were it not for our appreciation of the "synthesis" that results from their unique combinations. (A similar situation occurs in physics. In Newton's Third Law of Motion, action and reaction are equal and opposite. But each may be defined in a different way; the action being due to the dynamics of mass, whilst the reaction is from structural stiffness; both being necessary to consequentially generate the common resulting force.)

17.3.2 The Paired Attitudes to Loans and Credits

A customer, who is negotiating for a loan from a bank, reviews how he will use the money and when he will be able to return both the interest and the principle sum. These considerations are expressed in two one-way micro-economic activities. On the other hand, the banker who examines this situation from a greater distance should feel confident about the savings funds from where the credit is being drawn and about its overall rate of return. The bank must establish the criteria hopefully needed to ensure that the various clients take a responsible business-like attitude to their repayment. The banker also decides which of the alternate would-be creditors will not be so favoured.

The continuous borrowing of savings and returning of loans, which are characteristic of the HOUSE-HOLDER (saver), the CAPITALIST (mortgagee/investor), the FINANCE INSTITUTION (creditor) and the GOVERNMENT (national-business-maker), all result in far greater sums being annually turned over than being stored. In each case the dual attitude outlined above applies within a macroeconomics format and environment.

17.3.3 The Two- and Four-Faced Attitudes to Taxation

The HOUSE-HOLDER first takes a one-directional microeconomics attitude. Nobody wants to pay taxes. We object to loosing part of our earnings as income-tax, with an insulting value-added fraction of the cost of purchases to boot, then going to the GOVERNMENT. Yet these payments are necessary! The tax-payers are aware that the resulting national income is intended for the good of the whole country. They can see that the provision of essential public-services, the enforcement of law and order, national-security etc., requires certain governmental outlays. Consequently, they must accept this

macro-economic situation too. The initial shallow subjective approach is now converted into a dual one having greater overall objectivity, in a somewhat double-think style.

(Intelligent questions about this naturally arise, such as: "what tax is best from everybody's point of view?" and "is there such a thing as a good tax and if so what is it?" A start at answering these questions was made in Chapter 11. The subject also has long-term aspects and implications which are not pursued here. These are the political consequences of having first obtained a good understanding of the "big-picture".)

The two-faced attitudes taken by the GOVERNMENT entity are similar to the above HOUSE-HOLDERS kind, whilst being reversed. The various government ministries are interested in increasing their national budgets and in providing improved services to the public. However, it is only by new legislation that the Government can apply coercive pressure to collect the necessary funds. Were it not for their resulting unpopularity, the politicians would happily increase this amount of taxation. (As it is, the rejection of these "politically-incorrect" polices may tempt the Government into alternative forms of budget-balancing, including ministerial cut-backs, borrowing and the deliberate issue of new money and the resulting inflation.)

The considerations of the Government are actually four-faced. It must also examine how the additional public income may be used in budget-balancing, including its effect on the consumers in purchasing goods and the associated redistribution of the demand for labour. A government which wants to increase the amount of social services it provides cannot achieve this without taking something else away from the community, in order to cover the added cost. In fact it is on this point that the myth of job creation looses credence. The effect of the greater tax reduces the level of demand for consumer-goods, thereby socialistically removing employees from a productive form of industry whilst replacing them with social-service officers whose work-role is no less useful but completely different. This simple Hazlittian explanation is often hidden due to the many other simultaneous macroeconomics changes taking place, including an increase in government borrowing.

17.4 Effects of the Prices of Produce in the Simplified Theory of Equilibrium

Unlike its use in other more complicated models, the function of the price of specific quantities of goods-items is almost insignificant in our kind of equilibrium-seeking macroeconomics model. In this theory, an increase in the price of one kind of commodity results in a smaller physical quantity of it being demanded and exchanged, whilst a cut in its price has the opposite effect. Then either way, the total sums of money being spent on that type of item scarcely change. The substitution of one product for another also helps to the balance the different quantities being supplied for the particular amount of money available. Thus the influence of price variation is minimal in our modelling of macroeconomics, due to these pairs of counter-acting effects and also because the rest of the flows (and their decision-making coefficients) are almost unaffected.

The original matrix approach within the production sector by W. Leontief [12], as well as the classical kinds of localized equilibrium of L. Walras [10] (which actually are not sufficiently general to be so categorized), are continuations along micro-lines of the effects of pricing and the distribution of business within the production sector. They do not allow for overall effects on the whole social system, see above. Then the effect of prices should be generally regarded as being a microeconomics subject that is of minor significance compared to what happens when the MESS is taken at large. Consequently, price-structure is unworthy of being included in the macroeconomics model and its theory, as presented here.

When the prices do become significant in our model, it is due to comparative price influences in the decision-making blocks within the various entities. These effects may be introduced exogenously between the time-slices. Here, the decision-making ratios are affected and the substitution of alternate types of exchanges will follow in the subsequent cycles of equilibration. This is similar to the substitution decision-making of Chapter 10.4. The influence of the price of one kind of exchanged goods/money flow, is on the decision-making coefficients. Alternatively, a re-balance is less easily made, the same quantity being exchanged, but with the money coming from a modified source elsewhere in the system, with its decision-making coefficients controlling how this is felt. Overall price changes due to any inflation or deflation of the currency influencing the whole economy. In particular, these changes affect savers (creditors) and borrowers (debtors) who loose or gain respectively, in their accumulated and redeemed spending-powers.

The rate of interest set for savings is actually the price for lending money as credit. This decision is in competition to the alternatives of investment in

National Bonds or in shares in firms within the framework of the stock-market, or even in private business deals outside of this market. The degree by which these comparative price levels affect the national economy, should be included. However this is a different situation from that of the price for a particular kind of consumer or durable capital goods or for services. The demand and supply balance that occurs for both kinds of situations may seem to have something in common, but in the overall terms described here, the way that the Prime-Rate changes is on a basis of average or overall share behaviour, which is related to the amount of industrial growth and national prosperity.

17.5 General Equilibrium, Interest Rates **r** and the **LM** and **IS** Curves

General equilibrium is the result of balancing and substitution between the many money-flows. It is usually expressed by the stable rate of interest **r** for Prime-Rate borrowing, stock-market dividends and savings, all three reaching levels that correspond (if not equal) each other, with suitable adjustments for timing and ease of withdrawal of the particular investment. Equation (7) can be made to include this effect when suitable factors are included to allow for two of the rates not exactly being equal to the third. The competition between these different ways of investment creates a tension which keeps the system stable. When any of these rates change significantly the investors will naturally react, by withdrawing money from where the yield is comparatively low and investing it where it is most needed, at a higher rate of interest. These changes are normally independent of GOVERNMENT influence, with the Prime-Rate tending to follow the other two kinds. Attempts by this entity to interfere (such as by introducing changes to the savings-deposit reserve-ratio) can lead to temporary instability even though the stated long-term aim is the opposite.

In many more-recent works on macroeconomics, such as in J.B. Taylor's book [40], the "general equilibrium" is presented as the graphical or numerical solution of the associated money demand and its availability. This is expressed in monetarist's terms as the crossing-point on Figure 9 (Chapter 14) where the values of the quantities of money from **LM** or savings supply and **IS** or investment demand have one rate of interest. In the past, this approach was thought as being sufficiently general for determining the equilibrium of all the money-flow system, and therefore of the whole of the economy. This was without the effects of factors **i** and **s**.

However in the model and analyses described in this work, it has been shown that the **IS** curves apply only to the relationship between the CAPITALIST,

GOVERNMENT and the FINANCE INSTITUTION entities, and that the **LM** curves apply solely to the relationship between this latter entity and the HOUSE-HOLDER. The extent to which these entities are related to the whole system includes certain other functions too, consequently the true general equilibrium of the whole system is more involved than merely determining the crossing-points of these two curves. When trying to determine equilibrium the use of families of **LM** and **IS** curves and the effect of their various intersections on **r** (even with the **s** and **i** factors included) is a poor way to represent the full situation. Without including all of the money circuits, the limited ranges of interest-rate variation between these entities is unsatisfactory.

The proper approach to general equilibrium is more complicated than this, in that it depends on all of the factors given in the 19 variables and the iterations for money flowing between the 6 entities, as used here in the current model of the simplified system. This does not mean that there is no equilibrium to be found, although all of the variables are most likely to be simultaneously adjusting, but that the correct macroeconomics considerations are more complex, being necessary for getting this revised state of equilibrium completely determined.

This also implies that the decision-making associated with the adjustment of the Prime-Rate **r** should not simply to be determined from these intersections. Some indications as to the various factors influencing this decision have been provided in Chapter 12 and by the use of Equation (7). When taken in view of the decision-making procedures, this sheds a clearer light on the actual way that **r** is adjusted, although this particular expression does not cover the whole problem, due to exogenous changes introduced by the Government.

17.6 Confusion between Micro-Economic and Macro-Economic Situations

From the time of Plato (by his justice-seeking quest in "The Republic" [55]) there has been a tendency to regard macroeconomics as a scaled-up form of microeconomics. But this does not actually represent the true situation. We ourselves are elementary parts of the system, so we need to separate our objective thoughts about it when taken as a whole, from our subjective feelings about how the finer-scale situation directly affects us. To properly appreciate macroeconomics in a fair manner, we must avoid the difficulty of failing to see the wood for the trees. The process of thinking about the latter is different to our previous micro- approach and at first it is difficult to adjust our conception to suit it. It is necessary to see which aspects fall under a specific

unique macro-category and which parts of the micro- considerations are still applicable within this broader context.

17.6.1 The Attitudes to Business Start-Ups and the Wage-Fund Theory

It is easy to confuse microeconomics with macroeconomics when examining the entrepreneur's need to amass some "working-capital" before embarking on a new business venture. This would-be producer must carefully consider how his/her financial position is affected during the stage of business start-up. He/she should plan a financial time-table for the first few years, and prepare estimates for the rate at which the credit will be returned. It is no good taking an uncalculated risk that the business will grow and become worthwhile (even when selling sure-fire produce, like freshly baked bread and hot-cakes). The calculation for the probability of success of the activity should be based on more than blind faith.

However, when we look at start-ups in terms of the big-picture, the funding averages out and no "seed-money" is necessary. Temporary funding on micro-economic projects of particular entrepreneurs gives way to continuing money supplies, when loaded over longer time-periods. This is where the micro- approach of the separate firm gives way to the macro- approach of the whole of industry, for which continuous production occurs over a broad range of products. It includes the steady replacement of obsolescent durable capital goods (and companies), without necessarily having to make significant changes in the total sum invested. The failure of some new ventures and the success of certain others, together comprise the expected average way that change is experienced and progress made in this aspect of the business world.

An overall view of the macroeconomics process of making and using produce begins with the extraction of raw materials (minerals, plants, animals, etc.), from the surrounding landscape. The processing of these materials and their assembly into useful items of goods takes a while and some additional time is needed for their transport and storage, prior to the goods being sold, consumed or otherwise used. Thus for the various parts of this process within the time-slice, it is necessary to include a significant quantity of the materials as partly made goods and products being readied for dispatch, etc. The value of this "working capital" is regarded here also as being some of the investment (see Table 5 in Chapter 6). During steady production, the full amount of this working capital does not change and it is lumped together with the durable capital goods, from a point of view of total investment $\Sigma(I)$. In drawing up micro-economic balance sheets for the local products, care

should be taken to deduct the value of partly made goods being input to the producing organization from the value of the completed items. However in macroeconomics this aspect does not apply to the aggregate terms being considered.

There is a very strong tendency to attach the microeconomics properties of start-up finances of new companies to monetary macroeconomics too. The explanation in Chapter 16, for money-flow not being a limitation on national progress negates the associated micro-approach in favour of a general macro-approach instead. H. George [8] takes pains to show that the wages which are first paid to the newly employed workers, are in exchange for the added value that their labour has just created in the product (along with corresponding returns of ground-rents and interest or dividends). As the produce is sold, these monetary outlays are immediately recovered. Thus the Wage Fund Theory of J.S. Mill [51], an early microeconomics concept which claims that money must first be available for wages, is generally inappropriate to macroeconomics. However, the concept of some credit being needed for starting-up a new business by the purchase of durables, instead of them being borrowed, still endures within the microeconomics concepts. It is mostly recoverable--their inherent value and their ownership should not be regarded as a non-convertible investment. In any case, when aggregate considerations apply, this attitude is no longer valid, durable capital being transferable between entrepreneurs.

17.6.2 The Candle-Makers' Petition and the Analogy with Keynesian Theory

The use of microeconomics reasoning in macroeconomics situations is not only a recent failing. One of the earliest paradoxes caused by this kind of reasoning was presented by Frederic Bastait in his satirical essay on "The Candle-Makers Petition" in 1845 [11]. This proposal claimed that in common with other goods coming into the country from abroad, the importation of sunlight should be not tolerated and that all the windows should be blocked off. Instead, this would result in the Candle-Makers having to provide the necessary light from the production, distribution and use of their candles. They go on to claim that as a result of this supply the whole economy would prosper, because there would be so much more employment in the collection of sufficient raw materials, their preparation and in the making of the candles, that greater sums of money would flow around the whole social system (Candle-Makers being generous souls, would excel in spending what they would now additionally earn!). This essay was both an appeal favouring free-trade (as against cynically imposing custom's restriction on imports) and an example of what can be shown when only a part of the community's micro-

economy is treated as applicable to the whole, without properly considering how the money would otherwise circulate.

Keynesian Theory [42] concerning the "propensity to save" and the diminished multiplier due to this reduced rate of consumption is based on a similar kind of myopic concept. These savings are the result of the HOUSE-HOLDER'S deferment of satisfaction from direct use of his/her wages and the decision to set some of this money aside, with its apparently consequential negative effect on demand and employment. Even if this were initially true, the saved money certainly and subsequently would be loaned out for investment in durable capital goods, so that in practice this disadvantage of saving it would not last long.

17.6.3 Macroeconomics in Motion

Here, the famous paradox of the race between Achilles and the Tortoise comes to mind. The Tortoise crawls forward at a tenth of the speed of Achilles, but it is given a 90% advantage in distance. Provided that Achilles has not run the full course, the Tortoise always remains ahead. Like the Greek logician Zeno (described by J. Baggott [56]), who first framed this problem of motion, we too can restrict our view of the situation to the ever-decreasing micro-steps that approach but never reach the finishing-line. By the principle of induction, from the previous results, the Tortoise always must be declared the winner! Only after macro-projecting the motion to the end-point, can we sensibly demonstrate that the two contestants will finish the course together.

The micro-analysis finds an instant one-time application to the various individual details of the different entities, whereas in the iterative macro-analysis sense, the finite quantities are continuous and they are spread over the time-slice of a particular duration. These variables are actually flow-rates and not specific amounts of money, goods etc., so that on reaching the end of the time-slice the new state of equilibrium is apparent. This is equivalent to viewing the model from a greater perspective, in the same manner that Zeno's paradox is solved and the infinite series of numbers (in Chapter 7) summed to their mathematical (analytic) limit. In this sense, the unnecessary and confusing detail can be avoided.

The self-equilibrating of the system, which is described here, should be regarded as semi-static, when these comparatively small dynamical adjustments are compared to what can happen over longer time periods and the exogenous changes are of greater significance. However, it is

unreasonable to assume that the stabilizing nature of the system over the short-term should not be explained first. The analysis of these longer-term motions will need some additional assumptions that include the short-term effects, but it also must allow for growth or decline of the system, to include changes in money-values and the effects of business-cycles in a truly dynamic way.

17.7 Topological Aspects of the System (see also Chapter 9.6 and Table 7.)

One way of appreciating about what the big-picture consists is to examine it from a topological or mega-viewpoint. Topology is the branch of mathematics that deals with the configurations of communicating networks (as well as the physics of co-joined surfaces and their resulting solid bodies, certain geometric properties of which are unchanged by their being stretched or shrunk). The topology of the MESS is represented by the input-output flow matrix in Figure 2 of Chapter 7. It has places for up to 30 transacting variables, but only 19 of these are occupied. The remaining 11 gaps in this matrix, tell us where no more relationships are needed for our current social system. Indeed it would be very difficult to introduce any additional functional connections between the six entities that are envisaged here. Had all these spaces been occupied by money- and goods-flows etc., the sole means of controlling how the system operates would be solely by the kinds of decision-making processes and the magnitudes of their ratios. The existence of these 11 empty places (along with the other 19 viable connections), tells us that it is not only the decision-making criteria that affect the ability of the system to seek equilibrium. The social structure (of Figure 1) also significantly influences this liberty, by the absence of certain communication links; the topology of the matrix showing more clearly where this quest is inhibited, as well as the locations through which equilibrium can be sought.

The lack of symmetry and the specific arrangement of the communication links in the matrix imply that not every way of influencing the short-term behaviour of the system would have the same degree of effectiveness. Indeed, it is through our appreciation of the topology that we can best determine the criteria most suited to benefit the macro-economy as a whole. Regardless of the numerical values, it appears that such a policy largely should be based on the topological nature of the social system, as well as on the supplementary and particular circumstances for decision-making and money-flow. This also suggests that the examples in Chapter 11, where the introduction of different tax policies was examined, are of a greater significance than merely being a useful means for illustrating how the numerical analysis works.

The communications links that exist here have resulted from the particular ways by which the macroeconomics system developed, due to our natural participation in its social and commercial behaviour. For this system to have matured into any other arrangement would not normally be possible, without the application of some significant constraining-force, to inhibit the existing expressions of its progress. Thus the macro-economic structure of our society and civilization should be regarded as the inevitable result of an evolutionary process, by which mankind is actually extending his zoological ascent. Without our having the ability to accept the principles of private property ownership and of fair (contractual) trade, from a social/economic viewpoint we would still be living in the trees, or at best in many small communities each of which is so strongly polarized as to be unstable. Without the development of trading-objects and money, we would still be unable to efficiently transfer our produce. Without banking and savings we could not participate in a mixed free-market/capitalistic economy, nor have the ability to foresee, command and organize technological progress for its application to industry. Even so, our continuing tendency to make territorial claims and to monopolize the production of various lines of goods, grimly reminds us of our all too human past with its selfishness and aggressive, war-like nature, where the fear of insecurity and the compulsion for action replaced what normally should have been our pursuit of and confidence in social justice and altruistic generosity.

This presentation is thus seen to be not only how our social system looks to a distant observer, it also implies that this is the only way that it can properly exist, given the past and present conditions. Consequently, its topology should be seriously regarded as a naturally occurring phenomenon, arbitrary and artificial as it may at first appear. This mega-view should be no stranger to us than the fact that we prefer to live in man-made cities rather than (for example) to remain as migrating nomads on the face of a changing earth, where the pursuit of the seasonal grass is as essential an activity as breathing. Consequently this topological picture is a part of our placement in the world. As such, it is by the employment of a philosophy of the natural law, as explained by judge K. Jupp [57], that we should sincerely try to govern ourselves without bias, to better share the world's bounty in combination with the great opportunities created by our chosen sociological conventions.

17.8 Things Missed Out

In our modelling of the social system through this macroeconomics presentation, certain aspects have been avoided or omitted. Either they are

so big as to deserve a more serious independent analytic treatment, or possibly they can be mentioned here in a less formal way, without the need to enter into too much detail.

17.8.1 Long-Time Growth and Dynamics

The way that the system changes over many time slices depends not only on its equilibrium-seeking properties but also on the exogenous changes that can be introduced between the time-slices. Many of these are sudden step-changes due to governmental control or because of new external conditions in the commercial world of business, such a sudden rise in oil prices. In a work of this kind, which deals with short-term equilibrium, these analyses should be regarded as an additional subject, more suited to another dissertation rather than for inclusion here.

However, some general ideas can be obtained from this analysis without having to suppose that it is only the independent exogenous effects which play a part. The output values of certain variables over each time-slice will join into the starting conditions for the subsequent slice. In particular the various accumulators, as described in Table 5 Chapter 6.3.1, will accept the incremental values of I, M and S that are generated over the current interval. Associated with these increases, the changes in the total value and utility of the land, the replacement of older durable capital goods with some having greater effectiveness (due to their being designed using a more advanced technology), the increase in the numbers of working (and consuming) population and the continuing governmental investment in the surrounding infra-structure, all contribute to greater productivity and higher living standards as the macro-economy grows.

Actually, there is no certainty that any increase and growth will proceed smoothly. The problem of decline during the adverse half of "business-cycles" should not be forgotten, although the mechanism for its occurrence has not been properly described here. These dynamic effects are serious ones for the long-term progress of the state since they include both the disabling results of economic slumps and the halcyon periods of rapid progress. This means the allowance for business-cycles and the instable effects of inflation and stagflation. Another aspect omitted here is the creation of steady-growth macroeconomics over the long term.

17.8.2 The Rest-of-the-World

In this model it appears that the effect of the rest of the world has deliberately been missed out. The model does not have world trade flowing between

some of its entities and an additional entity which is called "The Rest-of-the-World" has been omitted.

Such a revision to the model is possible. The new entity would come with the penalty of making the model more complicated because at least four more new double-flows are needed. Two of these are for the import and export of goods and two more are to cover the international use of money and the connection between banks or governments with their foreign equivalents. This is to cover the way that foreign investment of both kinds is represented. However it should be remembered that the theoretical macroeconomics being examined here is about how the system works rather than about certain details of what it consists. Although these aspects of foreign trade and commerce are significant it can be seen that their kinds of operations are actually already included within their self-same exchanges carried out within the home country. It is simply that these home businesses would be enlarged to include the outside sphere without having to redraw the form of the model, because it all functions in the same way.

An alternative way of viewing this inclusion is to make the four entities PRODUCER, CAPITALIST, GOVERNMENT AND FINANCE INSTITUTE as doubles in the same manner as described in Appendix C for the expansion into a more detailed combination, to better include the existing function with the actual participants. The Input-Output or Leontief Matrix would then need to be of size 10 x 10 but its principle of use and its decision-making properties would remain the same as before. This kind of model would be convenient when the rate of exchange between the home and one foreign country is included. Otherwise it is necessary to make the conversions before all of the foreign effects are added and to work in the form of the currency in common use at home.

—·—

The elephant has departed, although

 its tail remains. (Marathi saying)

CITED BIBLIOGRAPHY in Alphabetical Order

The numbers before the author of the work are the numbers used in the text.

25   Allen R. G. D.
      "Macro-Economic Theory – A Mathematical Treatment" (1970)
      Corrected Edition, reprinted,
      Robert MacMillan and Co. Ltd., London and Basingstoke, 1970.

1   Aristotle
      "Nicomachian Ethics" (350 BCE)
      translated by Joe Sachs,
      Focus Philosophical Library,
      Focus Publishing/R. Pullins Company, Newburyport, Massachusetts,
                                                                    2002.

26   Ashby W. R.
      "Design for a Brain"
      Electronic Engineering, Vol. 20, pp 379--393, December 1948.

50   Auerbach A.J. and Kotlikoff L. J.
      "Macroeconomics – An Integrated Approach"
      Second Edition,
      The M.I.T. Press, Cambridge, Massachusetts, 1998.

23   Baker A.
      "Simplicity" (2004)
      Stanford Encyclopaedia of Philosophy, Editor: E. N. Zalta,
      Metaphysics Research Laboratory, Stanford University, Stanford,
                                                            California, 2011.

56   Baggott J.
      "A Beginner's Guide to Reality" (2004)
      Penguin Books, London, 2005.

11   Bastiat F.
       "The Candlemakers' Petition"--Satirical Essay
       Chapter VII, first series, pp 57--62
       Sophismes économiques, 1845.

54   Bazlington C.
       "The Free Lunch—Fairness with Freedom" (2002)
       Orchard-Four Books, Alresford, Hampshire, U.K. 2005.

39   Branston W. H. and Litvak J. M.
       "Macroeconomics"
       Second International Edition,
       Harper and Row Publishers Inc., New York, 1981.

30   Chen K.
       "Input-Output Economic Analysis of Environmental Impact"
       I.E.E. Transactions on Systems Management and Cybernetics,
       Vol. SMC 3. pp. 539-547, November 1973.

44   Dawkins D.
       "The Selfish Gene" (1976)
       Oxford University Press, New York, 1987.

17   De Bono E.
       "de Bono's Thinking Course"
       Revised Edition,
       BBC Books, BBC Enterprises Ltd., Harlow, August 1994.

51   Debreu G.
       "Theory of Value, An Axiomatic Analysis of Economic Equilibrium"
       Yale University Press, New Haven and London, 1959.

20   DiCesare F., Ensminger D. A., Bushkirk P. G. and Carlisle K. R.
       "Policy Analysis Modelling for Community Development in Small Cities"
       I.E.E. Transactions on Systems Management and Cybernetics,
       Vol. SMC 6. pp. 515-531, November 1973.

13   Dorfman R., Samuelson P.A. and Solow R.M.
       "Linear Programming and Economic Analysis" (1958)
       Dover Publications Inc., New York, 1987.

36   Eastman J.K.
       "Graphical Economics"
       The English University Press Ltd., London, 1960.

22   Feynman R.P.
       "The Pleasure OF Finding Things Out" (1999)
       Penguin Books Ltd., London, 2001.

43   Fisher I.
      "The Purchasing Power of Money: Its Determination and Relationship
      to Credit, Interest and Crisis" (1911)
      Second Edition, Republished,
      The Macmillan Co., New York, 1920.

16   Forrester J. W.
      "World Dynamics"
      Wright-Allen, Cambridge, Massachusetts, 1971.

47   Friedman M.
      "The Quantity Theory Of Money" (1912)
      in collected essays: "The Optimum Quantity of Money" (1969)
      Fourth Printing,
      Transaction Publishers, New Brunswick, New Jersey, 2006

24   Gafney M. and Harrison F.
      "The Corruption of Macroeconomics" (1994)
      Reprinted,
      Shepheard Walwyn Ltd., London, 2010.

8   George H.
      "Progress and Poverty – An Inquiry into the Cause of Industrial
      Depressions and Increase of Want With Increase of Wealth, the
      Remedy" (1879),
      Reprintrd, Robert Schalkenbach Foundation, New York, 1979.

41   Harrison, F.
      "The Power in the Land--An Inquiry into Unemployment, the Profits
      Crisis and Land Speculation"
      Shepheard Walwyn Ltd., London, 1983.

19   Hazlitt H.
      "Economics in One Lesson" (1946)
      Special edition for *The Foundation for Economic Education Inc*
      Pocket Books Inc. with Harper & Brothers, Rockfeller Center, New
                                                              York, 1952.
14   Hicks J.R.
      "Mr. Keynes and the Classics—A Suggested Interpretation"
      Econometria, Vol. 5, April 1937.

27   Hobbes T.
      "Leviathan, or the Matter, Forme and Power of a Common-Wealth,
      Ecclesiastical and Civil" (1651)
      Reprinted, Edited by Ian Shaprio,
      Yale University Press, London, 2010.

6   Hutt W.H.
      A Rehabilitation of Say's Law" (1974)
      Ohio University press, Athens, Ohio, 1979

57   Jupp K.
      "The Rule of Law and Other Essays"
      Shepheard Walwyn Ltd., London, 2005.

48   Keynes J.M.
      "The Economic Consequences of the Peace" (1919)
      Hardcourt, Brace and Howe, New York, 1920.

42   Keynes J. M.
      "General Theory of Employment, Interest and Money" (1936)
      Reprinted,
      Macmillan, London, 2007.

38   Knight F.H.
      Economic Organization, Vol.41,
      University of Chicago Press, Chicago, Illinois, 1933.

34   Kwack S.Y.
      "Policy Analysis with a Macroeconometric Model of Korea"
      Economic Modelling, Vol.3 No.3, Butterworths, London, July 1986.

37   Leontief W.W.
       "The Choice of Technology"
       Scientific American, Vol.252, No.6, June 1985.

12   Leontief W.W.
        "Input-Output Economics", 2nd edition,
        Oxford University Press, New York, 1986.

59   Lagos R.
      "Inside and Outside Money"
      Research Department Staff Report 374,
      Federal Reserve Bank of Minneapolis and University of New York,
                                                          2006.

53   Longe F.D.
      "(A Refutation of) The Wage Fund Theory"
      original pamphlet published by Longmans, London (1866)
      reprinted edition
      John Hopkins Press, Baltimor, Maryland, 1904.

45   Malthus T.
      "An Essay on the Principles of Population"
      Sixth Edition (1826)
      Reprinted by Oxford World Classics, England, 2008.

47   Mankiw N., Gregory N. and Taylor P.
      "Economics", Reprinted 2006,
      Thomson Learning, London.

5   Mantoux P.
      "The Industrial Revolution in the Eighteenth Century" (1907)
      Reset Edition,
      Harper and Row Ltd., New York, 1961.

10   Marshall A.
      "Principles of Economics, Volume 1" (1890)
      Revised, 8th. edition
      Reprinted by Prometheus Books for Macmillan and Co., London,
                                                          1920.

7   Marx K.
      "Das Kapital, Kritik der Politischen Ökonomie"
      Third Edition,
      Verlag von Otto Meisner, Germany, 1894.

58   Mesarovic M. D.
      "Views on General Systems Theory"
      John Wiley & Sons Inc., New York, 1964.

52   Mill J.S.
      "Principles of Political Economy" (1848)
      edited by Augustus M. Kelly
      Reprints of Economic Classics
      New York Bookseller, 1965

31   Mond J.
      "Chance and Necessity: An Essay on the Natural Philosophy of
      Modern Biology"
      Alfred A. Knop, New York, 1971.

29   Patterson K., Harnett I., Robinson G. and Ryding J.
      "The Bank of England Quarterly Model of the U.K. Economy"
      Economic Modelling, Vol.4 No.43, Butterworths, London, October
                                                              1987.
33   Penrose R.
      "The Emperors New Mind—Concerning Computers, Mind and the
      Laws of Physics" (1989)
      Vintage Books, Random House, London, 1990.

15   Phillips A.W.H.
      "The Relationship Between Unemployment and the Rate of Change of
      Money Wage Rates in the United Kingdom, 1861-1957"
      Economica, Vol. 25 (100), November 1958.

21   Pindyck R.S. and Rubinfield D. L.
      "Econometric Models and Economic Forecasts" (1981)
      Third Printing International Student's Edition,
      Second Edition,
      McGraw-Hill Int. Book Company, Singapore, 1984.

55   Plato
      "Diologues of Plato"
      edited by J.D. Kaplan
      Collector's Edition,
      Pocket Book Inc., New York, 1950.

2   Quesnay F.
      "Tableau Economique" (1759),
      see "Early Economic Thought, Selected Writings from Aristotle to
      Hume" edited by Arthur Eli Monroe, Cambridge, 1932,
      Annoted Edition, Dover Publications, NY. 2006

46   Roche C.O. "Understanding the Modern Monetary System"
       Orcam Financial Group, LLC,
       P.O.Box 91098, San Diago, C.A. 2012

4   Ricardo D.
       "The Principles of Political Economy and Taxation"
       John Murry, Albemerle-Street, London, 1817.

18   Shoven J.B.and Whalley J.
       "Applying General Equilibrium" (1992)
       Reprinted,
       Cambridge University Press, U.K. 1998.

3   Smith A.
       "An Inquiry Into the Nature and Causes of the Wealth of Nations"
                                                                          (1776)
        Reprinted, Modern Library,
        Random House, New York, 1994.

40   Taylor J. B.
       "Principles of Macroeconomics"
       Houghton Mifflin Company, Boston, Massachusetts, 1995.

35   Uhr C.G.
        "Economics in Brief"
         University of California, Riverside, 1966.

10   Walras L.
       "Elements of Pure Economics, or The Theory of Social Wealth",
        4th. Edition 1899, (translated by W. Jaffé, 1874),
        English translation1926, revised edition 1954,
        Reprinted, Routledge, Taylor and Francis Group, London, 2003.

32   Watson P.
       "A Terrible Beauty—The People and Ideas That Shaped the Modern
        Mind, A History" (2000)
        Second Impression,
        Pheonix Press, Weidenfeld and Nicolson, Great Britain, 2002.

28   Yan C-S.
        "Introduction to Input-Output Economics"
        Holt, Reinhart and Winston Inc., New York, 1969.

APPENDIX A   DEFINITION OF THE SYSTEM AND ITS PARTS

To readers who are unfamiliar with the systems-engineering approach taken here, the use of this concept is probably quite strange. However, it is possible and necessary to attune one's thinking along these lines, which are employed throughout this book. This approach allows the reader good access to the workings of the macroeconomics features of our society; the subject being presented in a more scientific and exact manner than what previously was adopted and used. Without the application of this concept, the idea of a functional macro-economy is vague and its analysis is unable to meet the more-exacting needs of this technological age. Consequently, the system that is assumed here not only resembles the social framework in which we live but also it is the result of this chosen method of thinking. The system and its parts are defined as follows:

SYSTEM:
A finite collection of member-parts (or entities) that share certain of their functions and communicate with each other over space and time, the general action being motivated and oriented towards one or more common goals.

MACRO-ECONOMIC SOCIAL SYSTEM (MESS):
The monetary and business aspects of our social system, being organized to function as the National Economy, when taken as a closed universe without external connections. Here, the common goal is to make the best use of the available resources, with the aim of justly achieving progress in technology and commerce, thereby continuously raising our aggregate living conditions. But in practice this is expressed by the various separate member-parts of the system, each adopting the optimal means for promoting its individual commitment to growth and prosperity.

ENTITY:
Comprises of a member-part or sub-division of the full MESS. Each part is chosen to plays at least one unique role, activity or function, within the system. Some of them perform many specific functions. Hence they are called entities. Each entity (or sub-system) has input and output ports and it communicates with other related entities, whilst autonomously governing its own internal affairs.

The following poem should prove helpful; so as to better appreciate what is involved. The author was Kenneth Boulding, (1910 - 1993), quoted by M.D. Mesarovic in [57].

Rationalizing About How Our Social System Works

A system is a big black box
Of which we can't unlock the locks
And all we can find out about
Is what goes in and what comes out.

Perceiving input-output pairs,
Related by parameters,
Permits us, sometimes, to relate
An input, output, and a state.

 If this relation's good and stable
Then to predict we may be able,
But if this fails us heaven forbid!
We'll be compelled to force the lid!

This describes a closed sub-system of the kind that by the convention in this book is called an entity. The MESS consists of a number of these entities that communicate as a network, being joined together by specific money-flows (which are reciprocal to the returning goods, services and valuable documents). The approach adopted here for understanding how our social system works is by studying the inputs and outputs to the entities (and the ways that they are regulated), somewhat similar to the poem.

As is seen in this book, access to the main system is not denied us, but the contents of each sub-system or entity are mostly "locked" away. The internal operations of these "boxes" badly need our attention and study, a problem that currently is only partly solved.

APPENDIX B DEFINITION OF THE FUNCTIONS OF THE IDEALIZED ENTITIES

In this appendix are defined all of the macroeconomic functions that are performed by the six entities. Although the entities are of an abstract and idealized nature, their functions essentially comprise all of the activities within the real social system where we live. Consequently, they represent each of its basic performance features as an aggregate. The underlined words are the expressions of these specific macro-economic actions. The actual participants in the real community combine these raw functions in varied proportions, as explained in Chapter 4.3 and in Appendix C.

For the paragraphs having a symbol (such as L1), the actions are defined and then described in detail. When a function is expressed by a money-flow (shown as an algebraic symbol in bold letters), the name of the exchanged quantity and the mutual entity (that connects with the current one where the functions are defined) is given. The type of flow is either contractual (11 + 3 returns), coercive-tax (4) or social-obligatory (1), and these 19 transactions correspond to the notation in   Figure 1 and Table 3.

Certain relationships between these functions and their expression within the real-life environment are also described below. These are intended to provide some insight about how each entity works, with a limited account of the dynamics. (These extra functions also help us to determine the organization within the entities that is outlined briefly in Chapter 6.3).

L. <u>LAND-LORD FUNCTIONS</u> 4 money-flows: **Rp, Rh, Tl, Hl**

L1. <u>Restricts</u> the freedom of access to land and hence determines the availability of its natural resources and the intensity of their utilization. (This does not include public areas needed for transport, communications, worship, education, recreation, social-gathering, government, emergency services, public-utility, military-security, national research establishments etc.)

By withholding land from use (for purposes of self-gratification or speculation) or by permitting only limited use to be made of it, this entity restricts the opportunities for production and distribution, home-comfort or public-service. This monopolistic action also raises the price of the land that is currently available and it increases the ground-rent that can be demanded, due to the competition for the most convenient and vacant sites.

L2. <u>Leases-out</u> much non-public land, regardless of the land's potential utilization, (namely for mining, fisheries, forestry, grazing, agriculture, manufacture and industry, commerce, sport and residence, see Appendix G) and <u>gathers</u> the contractual ground-rents **Rh** from the HOUSE-HOLDER and **Rp** from the PRODUCER, these two entities being the sole kinds of land-user who agree to <u>convey</u> these sums. They may permissively operate above or below its surface, even when direct access onto the land has been previously allotted or denied.

L3. <u>Pays</u> certain local and national GOVERNMENT coercive taxes **Tl,** which are based on land-value. In return receives protection of ownership rights and the opportunity for land confinement and speculation in its value.

L4. <u>Transfers</u> the remaining money to the CAPITALIST **Hl**. This flow is due to an understanding between these two entities. Consequently the latter entity is sectored - one part only receiving this benefit. (In practice actual land-owners also operate as capitalists, so the transfer of this money is mostly automatic.)

G. <u>GOVERNMENT FUNCTIONS</u> 7 money-flows: **Tl, Th, Tp, Tc, Cg, M,**
$$r\sum(M)$$

G1. <u>Collects</u> 4 kinds of coercive taxes from the LAND-LORD **Tl**, HOUSE-HOLDER **Th**, PRODUCER **Tp** and CAPITALIST **Tc** entities. These payments largely sustain the national annual income or budget, which is balanced, see G4.

G2. Contractually <u>purchases</u> consumer and durable capital goods and social services from the PRODUCER for storage and re-distribution, as appropriations **Cg** that comprise much of the budget. This includes the expenditures for general-public services in roads, transport, water supply, sewage disposal, communication, public-safety, etc. The effect of these activities is that the community's surroundings and infra-structure considerably improve – after the investment of the local taxes into numerous kinds of social services, with a significant increase in the intensity of usefulness of the land and its value.

This entity also provides budgets for non-productive services (or at least the ones that are indirect), such as the status of civil administrators, national defence, education institutions, museums and libraries, religious centres, nature-reserves, preservation of historic buildings, recreation, arts, social centres, public health, police, detention centres, emergency services etc.

G3. Supplies monetary subsidies, in the form of tax exemptions, insurance, unemployment doles, pensions, disabled persons' allowances, etc. Supports specially-favoured local projects and provides assistance and guarantees for certain investments in developments that are of national importance.

G4. Contractually sells and redeems bonds **M** on the open-market, to or from the FINANCE INSTITUTION (which includes the National Bank), using the money to balance the budget (and to adjust the National Deficit), and returns interest $r\sum(M)$ on the accumulated credit.

G5. Regulates the quantity of money that effectively is in circulation. To stimulate the macro-economy and increase the demand for goods, it adds to this sum by:

   a) the redemption of the bonds in function G4.
   b) the infusion of newly printed currency into the economy and
   c) the easing of various criteria by which the banks are permitted to extend credit, particularly the reserve-ratio on savings deposit accounts (which is for meeting sudden demands by creditors, in times of trading loss or panic).

Alternatively, to slow-down the progress of the macro-economy and reduce the demand for goods, it executes the reverse of the three procedures listed above.

G6. Adjusts the Prime-Rate of interest **r** on its bonds (covering the National Deficit), as a secondary means of influencing new investment in business activity. This action is performed with the cooperation of the FINANCE INSTITUTION, and it affects the supply of new and updated credit from the HOUSE-HOLDER whose decision on the use of money is either for consumption or for savings and debts.

This also indirectly affects the CAPITALIST through the stock-market, which quickly varies the trading price of its dealings in second-hand shares and bonds, in order that the rates of dividends and interest will approximately conform to the new Prime-Rate. Speculation in changes to the rate of interest affects the value of the shares, so this investment feature is very responsive. Actions G5 and G6 can be performed simultaneously to stimulate the system by lowering the Prime-Rate. A combination in the opposite effects can be used to slow down progress of the MESS.

This action also applies less directly to the demand for long-term investments in durable goods (often in heavy industry). An alteration in the gap between the Prime-Rate and the effective dividend rate (after allowing for depreciation of durable capital goods and taxation), motivates the CAPITALIST who is working with industry, to expand or contract his/her current investment activity.

H. <u>HOUSE-HOLDER FUNCTIONS</u> 7 money-flows: **Wp, S, rs∑(S), Th, Ch,**
Rh, Hh

This entity actually has the dual functions of **_Worker_** and **_Consumer_**.

Worker functions:

H1. <u>Earns</u> wages **Wp** for contractually supplied labour to the PRODUCER. The remuneration of these wages provides the major source of personal income.

H2. <u>Pays</u> coercive income-tax **Th** (less pensions, unemployment doles and other allowances) to the GOVERNMENT. These taxes are related to the gross income and the size of the family unit (which may contain more than one worker and a number of dependents).

H3. <u>Saves</u> money **S** from his/her net income by lending it to the FINANCE INSTITUTION, or bank **S+** (or alternatively, <u>borrows</u> money from it **S--**). Both these actions are contractual with the exchange of money for redeemable savings certificates. Subsequently <u>receives</u> (or <u>returns</u>) the interest **rs∑(S)**, on the accumulating credit (or debt). (Note that saving is not assumed here to be a CAPITALIST activity, for which see items C1 – C6).

H4. "Non-Production" within the home is not included in the total of the gross domestic product because its results are produced and consumed (enjoyed) within this entity. However, the home-management, cooking, cleaning, clothes-washing, house-maintenance, shopping, kitchen-gardening, child-raising, etc., largely but not entirely executed by the house-wife, are a very real part of the macro-economy and without their results the wage-earner would be unable to function properly or help to raise the next generation.

Consumer functions:

H5. Contractually <u>purchases</u> (and occasionally accepts gratuitously) all of the consumer goods and services **Ch** from the PRODUCER, which are quickly enjoyed and depleted. Non-productive durable goods that are used by the

CONSEQUENTIAL MACROECONOMICS

HOUSE-HOLDER are not owned by this entity, since it does not function as a CAPITALIST. (When a HOUSE-HOLDER uses his/her car for pleasure, this non-productive action is a form of consumption. However, when a company car is used for business, the action comprises part of a PRODUCER function, since a transportation service is being provided. But in both circumstances the car itself is hired-out from the CAPITALIST functioning entity, during actions C3 and part of C4.)

 H6. <u>Pays</u> coercive local GOVERNMENT taxes **Th** that relate to its use of public utilities or services. In return receives subsidized or free (but limited) social services from this entity such as communal aid, education, medical treatment, local and national security, municipal utilities, entertainment, use of public transport (by the geriatric sector), recreation and emergency services etc.

 H7. <u>Conveys</u> contractual ground-rent **Rh** to the LAND-LORD for the right of access to the land on which his/her (hired-out) house stands.

 H8. As the national community but without power of denial, unknowingly <u>surrenders</u> to the LAND-LORD the overall rights of access to the nation's land and natural resources (that would otherwise provide greater opportunity for labour, home-comfort, recreation etc.)

 H9. <u>Remits</u> contractual hire-fees **Hh** to the CAPITALIST for the leasing of his/her house and other non-productive durable goods (to cover depreciation and the rate of interest on the investment, see below). (In practice for an actual residence, the "rent" that is paid by the real House-Holder covers both actions H7 and H9.) (Note, the ownership of the HOUSHOLDERS home is a CAPITALIST function, and is not included here.)

H10. <u>Keeps</u> in-hand some working money, for convenience of its use.

P. <u>PRODUCER FUNCTIONS</u> 7 money-flows: **Ch, Cg, Cc, Tp, Wp, Rp, Hp**

 P1. By good organizational <u>management</u>, efficiently combines the three factors of production, land, labour and capital, the last being supplied by the CAPITALIST as durable capital goods or facilities and partly worked materials. (Note: that as soon as raw materials are extracted from the land, they become incomplete goods, holding this status as they are worked into produce that is ready for sale. In viewing the PRODUCER as a whole, these goods are not seen here to pass between the various sectors of real industry.

However, at any instant in time, some of the capital investment is in this form having wealth-value that lags behind the current output.) These three factors are used for the continuous production and distribution of all kinds of commercial goods and the supply of certain utilities and services.

P2. Contractually <u>sells</u> various kinds of produce including houses, utilities and services. These being: consumer-goods **Ch** to the HOUSE-HOLDER, durable goods **Cc** to the CAPITALIST and appropriations **Cg** to the GOVERNMENT. This activity provides the PRODUCER with an income for use in activities P3, P4, P5 and P6.

P3. <u>Pays</u> coercive tax **Tp** to the GOVERNMENT. This may be proportional to the number of employees or to the yield after wages and ground-rent have been met. Also pays Value Added Tax, the cost of which is based on and included in the price of the goods that are sold. In return receives certain municipal or rural services that generally enhance the capacity for production activities.

P4. On a contractual basis for the return on this factor of production, <u>remunerates</u> wages **Wp** to the HOUSE-HOLDER for the supply of his/her labour.

P5. On a contractual basis for the return on this factor of production, <u>conveys</u> ground-rent **Rp** to the LAND-LORD for the lease of access to and use of the land on which his/her (hired-out) durable capital goods (buildings, installation, factory, etc.) are located.

P6. Following activities P3, P4 and P5, deducts the expenses of maintenance of the durable capital goods and taxation before <u>transferring</u> the socially obligatory third return, yield **Hp** for the loan of the durable goods as an investment. In business concerns, this money-flow (when it is present) is passed to the CAPITALIST without pre-conditions. When the PRODUCER functions independently of the CAPITALIST, this hire-fee **Hp** becomes contractual and is <u>remitted</u> in proportion to the sum invested in the durable capital goods. (Although these money-flows are sometimes called "profit", they actually are used to cover the taxes, depreciation of durables and net return or yield on investment.)

P7. Occasionally <u>receives</u> subsidies from the GOVERNMENT as money, tax relief or services for the deliberate reduced efficiency in specific types of production. (The payments may be conditional, to ensure that production quotas are not exceeded, due to a protectionist policy for certain alternative sources).

CONSEQUENTIAL MACROECONOMICS

C. <u>CAPITALIST FUNCTIONS</u> 7 money-flows: **I, ri∑(I), Cc, Hp, Hh, Tc, Hl**

C1. Acting as a Registered Public Company, <u>issues</u> legal documents (or "shares") of these various companies, which may include certain voting rights (on policy decisions). By this contract <u>borrows</u> from the FINANCE INSTITUTION, money **I** for investment and <u>returns</u> dividends **ri∑(I)** to the associated share-holders.

Due to excessive or diminutive yields and the associated returns on this investment, the second-hand value of the shares automatically rises or falls to make the dividend roughly commensurable to the Prime-Rate. (Successful companies prefer to improve their installations, rather than pass the excess to their share-holders. Less successful companies either return smaller dividends after covering their depreciation, or allocate normal dividends to keep share prices steady, whilst allowing their plant to become obsolete.)

C2. Acting as a Private Company or family unit, contractually <u>borrows</u> from the FINANCE INSTITUTION, money **I** for short-term loans as well as for the long-term mortgage of property. <u>Returns</u> interest **ri∑(I)** on the credit, which is <u>redeemed</u> after the agreed time period has elapsed, or by frequent and regular mortgage payments that cover the debt and the interest together.

C3. <u>Invests</u> money **Cc** for the contracted <u>purchase</u> from the PRODUCER of durable capital goods (including non-productive houses, cars, etc.), which are then <u>hired-out</u> to the PRODUCER and HOUSE-HOLDER respectively under the specific terms of action C4.

C4. <u>Accepts</u> (after prior deduction of tax and maintenance expenses) the yield **Hp** and hire-fees **Hh** from the respective loans of durable goods to the PRODUCER and HOUSE-HOLDER, as mentioned in actions P6. and H9. These fees are partly contractual, but the most of the PRODUCERS are closely connected to the CAPITALIST and the former are sociologically obliged to transfer this yield.

C5. <u>Pays</u> coercive property and profits taxes **Tc** to the GOVERNMENT and in return obtains certain social services from this entity, such as grants and loans to encourage certain kinds of investments in industry. This may also take the form of loan guarantees and insurance for otherwise risky ventures that are of national importance.

C6. <u>Receives</u> as additional income much of the ground-rent **HI** collected by the LAND-LORD, which is <u>transferred</u> to the sector of this entity that has "landed connections" on a socially obligatory basis, see function L4. (This payment is often invisible in practice, due to the closeness of the two entities.)

F. <u>FINANCE INSTITUTION FUNCTIONS</u> 6 money-flows: **S, rs$\sum$(S), I,**
$$\textbf{ri}\sum\textbf{(I), M, r}\sum\textbf{(M)}$$

F1. Acting as a bank or building society, on a contractual basis this entity <u>borrows</u> savings **S** from the HOUSE-HOLDER and <u>returns</u> to him/her the interest **rs$\sum$(S)** on his/her accumulated debit. On this basis <u>issues</u> savings certificates that are redeemable. (From these savings the bank or building society draws its strength, since most of this money can be used for investment, as described below). Accumulates and <u>holds</u> in vaults a money reserve, which is a small proportion of the total savings deposit. This proportion is specified and controlled by the finance department of the GOVERNMENT.

F2. Acting as an agglomerate investor, contractually <u>lends</u> money for public and private company shares, for use as investments **I** by the CAPITALIST. In return <u>receives</u> and accumulates the share certificates and the resulting dividends **ri$\sum$(I)** (and voting rights) on the debt that it bears.

 F3. Acting as a building society, <u>lends</u> money **I** for mortgage contracts with the CAPITALIST (against the value of the buildings and landed properties), for which it fixes and <u>receives</u> regular redemptive payments and interest **ri$\sum$(I)**.

 F4. Acting as the National Bank, assists the GOVERNMENT by contractual <u>purchase or redemption</u> of its accumulated amounts of National Bonds **M** (i.e. part of the National Deficit, see action G4.) and <u>receives</u> (or <u>returns</u>) the interest **r$\sum$(M)** with the corresponding reciprocal flow of money into or out of use for the budget. Assists the GOVERNMENT, with the control of money in circulation, by action G5. and the adjustments to the Prime-Rate of interest by action G6.

APPENDIX C USE OF THE RECIPE MATRIX

The original concept of taking a combination of numerical quantities in the form of a recipe, was suggested by W.W. Leontief in [12], where he showed that a particular production industry or sector does not function alone, but it combines various proportions of other production sectors. Leontief used the input/output matrix of his original theory to obtain and explain this concept, where the production entity is divided into a large number of sectors, each representing a different kind of industry.

The analysis given here, actually determines the input/output matrix by a more basic argument, using a graphics/analytic approach applied to the whole of the macro-economy. In this approach each functional element (or entity) is considered to be representative of the various and actual activities that are performed by the aggregate of a large population. However, this alternative approach should not be seen as a replacement for that used by Leontief, but rather as a parallel concept.

In our analysis it is also possible express the input/output matrix in a specific manner, to allow for actual people, agents or sectors of the system to behave in a micro-economic manner. One can take combinations of the six entities that are described below, in the same way that Leontief first proposed using the various branches of industry. The point being made here is that both kinds of representations can be applied together, the matrix method being sufficiently general to accommodate all of them. Then each agent behaves as if he were a mixture of the various proportions of the six basic functional entities.

Using the example in Section 4.3, of an actual house-holder who is fulfilling many roles and responsibilities, the micro-economic proportions of his/her macro-economic participation could possibly be as follows:

LAND-LORD (Land-Owner) 10% ,
GOVERNMENT (Philanthropist) 2% ,
HOUSE-HOLDER (Worker/Home-Maker) 40% ,
PRODUCER (Manager/Employer) 5% ,
CAPITALIST (House/Car/Business-Owner) 35% ,
FINANCE INSTITUTION (Investor in Shares) 8% ,

the total participation in these various roles being 100%. This situation may be represented by the following recipe row matrix:

	L	G	H	P	C	F
[R1] =	0.10	0.02	0.40	0.05	0.35	0.08

(C1).

A second participant who is less of a HOUSE-HOLDER, may be more active in Land-Ownership than in Home-Making. Then his/her recipe row will contain different proportions of these six functions - the first activity (under the "L" term) carrying the most weight. Continuing the example of Equation (C1), for a two-sector community:

	L	G	H	P	C	F
[R2] =	0.10	0.02	0.40	0.05	0.35	0.08
	0.30	0.01	0.25	0.20	0.10	0.14

(C2).

This kind of statement of the various proportions of the functions or roles being played, may be repeated as many times as there are agents, people, families or sectors in the community, the total number being taken as an integer **n** . In Equation (C2), writing the rows in succession, results in a rectangular matrix having 2 rows and 6 columns.

To obtain the input/output matrix for the changed set of participants, the following matrix multiplication procedure is then used, which modifies the functional (ideal entity) data:

$$[An] = [Rn] \times [A] \times [Rn]^t$$ (C3),

where: **[An]** is the resulting input/output matrix, of size (**n** x **n**), for the population of **n** (instead of the 6 idealized entities previously used),

    [Rn] is the recipe matrix, of size **n** x 6 as described above,

    [A] is the input/output matrix, size (6 x 6), of Figure 2, and

    [Rn]^t is the transposed recipe **[Rn]** matrix, having it's rows and columns interchanged, of size 6 x **n.**

In equation (C3) the modified **[A]** matrix is respectively pre- and post-multiplied by the recipe matrix and its transpose. The number of rows **n** lies between 2 and the greatest value for which calculations are possible, depending on the number of sectors being considered and/or the capacity of the computer to handle large matrices. For an explanation of matrix multiplication see Reference 6, or any basic treatment of matrix arithmetic.

CONSEQUENTIAL MACROECONOMICS

The following example shows how this matrix arithmetic works in practice. Suppose that the population comprises the previous 6 basic entities (now taken as if they were actual people) plus a seventh person proportionately fulfilling the various roles that were shown in Equation (C1). Then **n** = 7. The first 6 rows of the recipe matrix **[R7]** shown below, convert the ideal entities into actual people playing the same roles, by means of the diagonal arrangement. The bottom line of the **[R7]** matrix represents the combination of roles that is taken from Equation (C1) for the new participant.

	L	G	H	P	C	F
[R7] =	1.00					
		1.00				
7 rows			1.00			
and 6				1.00		
columns					1.00	
						1.00
new row	0.10	0.02	0.40	0.05	0.35	0.08

(C4).

After pre-multiplication of matrix **[A + UNI]** by the recipe matrix **[R7]** the following intermediate matrix is obtained:

[A7'] = 7 rows and 6 columns

L	G	H	P	C	F
--		Rh	Rp		
Tl	--	Th	Tp	Tc	M
		--	Wp		rs∑(S)
	Cg	Ch	--	Cc	
Hl		Hh	Hp	--	I
	r∑(M)	S		ri∑(I)	--
0.02 x **Tl** +0.35 x **Hl**	0.05 x **Cg** +0.08 x **r∑(M)**	0.10 x **Rh** +0.02 x **Th** +0.05 x **Ch** +0.35 x **Hh** +0.08 x **S**	0.10 x **Rp** +0.02 x **Tp** +0.40 x **Wp** +0.35 x **Hp**	0.02 x **Tc** +0.05 x **Cc** +0.08 x **ri∑(I)**	0.02 x **M** +0.40 x **rs∑(S)** +0.35 x **I**

After post-multiplying by the transposed recipe matrix **[R]^t** this finally produces:

[A7] = 7 rows and 7 columns

L	G	H	P	C	F	New
--		Rh	Rp			0.40 x **Rh** +0.05 x **Rp**
Tl	--	Th	Tp	Tc	M	0.10 x **Tl** +0.40 x **Th** +0.05 x **Tp** +0.35 x **Tc** +0.08 x **M**
		--	Wp		rs∑(S)	0.05 x **Wp** +0.08 x **rs∑(S)**
	Cg	Ch	--	Cc		0.02 x **Cg** +0.40 x **Ch** +0.35 x **Cc**
Hl		Hh	Hp	--	I	0.10 x **Hl** +0.40 x **Hh** +0.05 x **Hp** +0.08 x **I**
	r∑(M)	S		ri∑(I)	--	0.02 x **r∑(M)** +0.40 x **S** +0.35 x **ri∑(I)**
0.02 x **Tl** +0.35 x **Hl**	0.05 x **Cg** +0.08 x **r∑(M)**	0.10 x **Rh** +0.02 x **Th** +0.05 x **Ch** +0.35 x **Hh** +0.08 x **S**	0.10 x **Rp** +0.02 x **Tp** +0.40 x **Wp** +0.35 x **Hp**	0.02 x **Tc** +0.05 x **Cc** +0.08 x **ri∑(I)**	0.02 x **M** +0.40 x **rs∑(S)** +0.35 x **I**	--

In this example the **[A7]** matrix can be partitioned and compared, where it is seen that the original **[A]** matrix is part of this population. This matrix was deliberately retained in the first 6 rows and columns, and the effects of the new member of the community are clearly seen in the last row and column. Due to this addition to the community, the 7 sums of the specific rows and columns are no longer in the previous state of equilibrium, (which may have existed in matrix **[A]**) and it should be re-established, see Chapter 8.

The multiplication procedure of Equation (C2) is applicable to all the participants in the macro-economy and in theory this process enables the entire population to be represented. By this process the input/output **[A]** matrix has been transformed into the **[An]** matrix, the size of which is now (6 + **n**) and which contains all of the mutual terms for the relationships between the various agents. This square matrix is now in the form that was originally proposed by Leontief and it may be treated in the same manner as he used for determining its statistical properties.

CONSEQUENTIAL MACROECONOMICS

This procedure complicates the presentation of the data and renders it less meaningful. Consequently the approach best fitted to our analysis and to the understanding of the macro-economic functions used here, deliberately avoids any repetition of the various operations. This is achieved by introducing as many blank spaces into the original **[A]** matrix as is possible and by expressing the role-playing functions of the entities in their most basic form.

APPENDIX D NUMERICAL EXAMPLES, USING THE IDENTITY EQUATIONS AND THEIR MATRIX

EXAMPLE 1.
                DATA SET FOR "EUROPEAN/SOCIALIST" MACRO-ECONOMY

For this hypothetical country's MESS, the current values of the 19 money-flows are   given in both the Identity Equation and the matrix forms. The following description explains the proportions of the money-flow that are adopted. The paragraph numbers below correspond to the identity-equations. All the numerical values of these flows are in Billion of Dollars (B\$ or \$$10^9$) over a one-year time-slice, unless otherwise stated.

1. The effect of rent controls has kept the LAND-LORD'S income **LRN** to a small proportion of the Gross Domestic Product **GDP**. Three times as much land-value is used for production as for residence. However, only a small part of the resulting ground-rent is collected by the GOVERNMENT as a revenue **Tl** .

2. There are heavy rates on the other three kinds of taxation **Th** , **Tp** and **Tc** that characterize this high welfare country. The National Deficit is growing and its interest **r Σ(M)** costs the GOVERNMENT 16.7% of the National Budget **GNB** , but even so a vigorous programme of national investment (and social service) **Cg** is being pursued.

3. The working population is 10 million with an aggregate wage of \$2,000 per month. Thus gross yearly earnings are:

$$Y = 12 \times \$2,000 \times 10,000,000 = \$240,000,000,000 = 240 \text{ B\$.}$$

All of this is spent, saved or taxed away, with the additional new savings being equal to the interest returned on the total already saved. The average expenditure on consumer goods slightly exceeds that spent on residences, for the use of land and buildings, with income-tax taking 38.5% of the workers' annual aggregate income **Y**.

4. A large part of the production effort is for GOVERNMENT requisites used for public investment and welfare. The extent of the production of durable goods is also large compared to consumption. Wages **Wp** form the largest (over 50%) part of PRODUCER-returned expenses with the yield for the use of capital durable goods **Hp** (25%) being second, and the ground-rent **Rp** on productive land (12%) is least. The retail tax **Tp** (or V.A.T.) on consumer and durable goods, is almost 17% of aggregate sales.

CONSEQUENTIAL MACROECONOMICS

5. The largest item of income to the CAPITALIST is from the hire-fees of durable goods **Hp** with half as much coming from the new investment and also from the LAND-LORD'S money-transfer obligations (or "understandings"). About 2/3 of this is used for purchase of new capital (durable) goods **Cc** with a relatively small tax **Tc** on this property and the rest is returned as interest on past investment.

6. The returned interest on GOVERNMENT Bonds and on mortgages with shares, are of equal amounts and comprise most of the income of the FINANCE INSTITUTION, with new savings at only 20 % of the total **FIC**. The majority of this is used for further investment in shares with smaller amounts being added to the GOVERNMENTAL Deficit or used for "servicing" the current savings at the banks.

The 6 identity equations are repeated here with the numerical values written on the line below, to correspond with the algebraic terms. Each term appears twice. The totals for each line are at the right-hand side.

ENTITY (…):   INPUTS (ROWS) = OUTPUTS (COLUMNS)   = TOTAL

LAND-LORD L: **Rh + Rp = Tl + Hl**   = **LRN** (1)
                        20 + 60 = 20 + 60   = 80

GOVERNMENT G: **Tl + Th + Tp + Tc + M = Cg + r∑(M)**   = **GNB** (2)
                20 + 100 + 50 + 50 + 20 = 200 + 40   = 240

HOUSE-HOLDER H: **Wp + rs∑(S) = Rh + Th + Ch + Hh + S**   = **Y** (3)
                  240 + 20   = 20 +100 + 80 + 40 + 20   = 260

PRODUCER P: **Cg + Ch + Cc = Rp + Tp + Wp + Hp**   = **GDP** (4)
             200 + 80 + 190 = 60 + 50 + 240 +120   = 470

CAPITALIST C: **Hl + Hh + Hp + I = Tc + Cc + ri∑(I)**   = **CPL** (5)
             60 + 40 + 120 + 60 = 50 + 190 + 40   = 280

FINANCE INSTITUTION F: **S + r∑(M) + ri∑(I) = M + I + rs∑(S)** = **FIC** (6)
                  40 + 20 +   40   = 20 + 60 + 20   = 100

This may be presented in the matrix form, where as seen in Chapter 7 each money- flow term appears only once. In the following matrix (using the modified order of Figure 4) the algebraic symbol is shown above the

numerical value and the totals are equal in both input and output directions, indicating that equilibrium is established.

MATRIX D1. INPUT/OUTPUT OF BASIC MESS

COLUMN \ ROW OUTPUTS\INPUTS	G	F	C	L	P	H	TOTALS
GOVERNMENT G	\	M 20	Tc 50	Tl 20	Tp 50	Th 100	GNB 240
FINANCE INSTITUTION F	$r\Sigma(M)$ 40	\	$ri\Sigma(I)$ 40	0	0	S 20	FIC 100
CAPITALIST C	0	I 60	\	Hl 60	Hp 120	Hh 40	CPL 280
LAND-LORD L	0	0	0	\	Rp 60	Rh 20	LRN 80
PRODUCER P	Cg 200	0	Cc 190	0	\	Ch 80	GDP 470
HOUSE-HOLDER H	0	$rs\Sigma(S)$ 20	0	0	Wp 240	\	Y 260
TOTALS	240	100	280	80	470	260	

Macro-economic Indicators:
Consumption/Wages = Ch/Wp   = 80/240   = 0.333
Wages/Produce   = Wp/GDP   = 240/470 = 0.511
Taxes/Produce   = (GNB – M)/GDP = 220/470 = 0.468
Savings/Wages   = S/Wp   = 20/240   = 0.0833
Investment/Produce = I/GDP   = 60/470   = 0.128

Now we will investigate what happens when the Government changes the amount and kind of taxation collected for national investment in public works. The effects of different policies by the GOVERNMENT and by the HOUSE-HOLDER entities will be examined. In the three examples that follow, the form of the previous matrix is repeated, but an extra line below the numbers records the changes that are needed for the re-establishment of equilibrium. The sign here can be positive or negative, depending on the kind of alteration made to the particular sum. The simplified decision-making ratios used in this analysis are shown on the pages that follow the matrix, where their effects are briefly described.

CONSEQUENTIAL MACROECONOMICS

EXAMPLE 2. THE EFFECT OF REDUCED INCOME-TAX (AND INCREASED CONSUMPTION, BY THE HOUSE-HOLDER)

We now consider this macro-economy after the GOVERNMENT shrinks the public building programme and collects 20 B$ less income-tax **Th**. In response, the HOUSE-HOLDER decides (see Table 9) to increase home expenditure on consumer goods **Ch** , but finds that he/she can use only half of the increment in taxation, since there is some difficulty in changing the production from social services to consumer goods, whilst the wages are initially reduced, due to the smaller current total demands.

MATRIX D2.1 INPUT/OUTPUT OF INCOME-TAX REDUCED MESS

COLUMN \ ROW OUTPUTS\INPUTS	G	F	C	L	P	H	TOTALS & INCRE- MENTS
GOVERNMENT G	\	M 20	Tc 50	Tl 20	Tp 50	Th 100 -20	GNB 240 -20
FINANCE INSTITUTION F	rΣ(M) 40	\	riΣ(I) 40	0	0	S 20	FIC 100 0
CAPITALIST C	0	I 60	\	HI 60	Hp 120	Hh 40	CPL 280 0
LAND-LORD L	0	0	0	\	Rp 60	Rh 20	LRN 80 0
PRODUCER P	Cg 200 -20	0	Cc 190	0	\	Ch 80 +10	GDP 470 -10
HOUSE-HOLDER H	0	rsΣ(S) 20	0	0	Wp 240 -10	\	Y 260 -10
TOTALS AND INCREMENTS	240 -20	100 0	280 0	80 0	470 -10	260 -10	

Due to HOUSE-HOLDER deciding to consume more, the effect of the smaller tax-on- production is not felt by the rest of the MESS. The diminished labour required for new national (GOVERNMENT) projects, affects only 2 other entities. These are the PRODUCER and the HOUSE-HOLDER, who together have to decrease the extent of their macroeconomic

activities. The total reduction by 20 B$ of these actions, is the same amount as the cut in taxation.

Macro-economic Indicators: Compared
                                                      to Example 1.

Consumption/Wages **= Ch/Wp** = 90/230 = 0.391 17.4 % more
Wages/Produce **= Wp/GDP** = 230/460 = 0.500 2.08 % less
Taxes/Produce **= (GNB − M)/GDP** = 200/460 = 0.435 7.11 % less
Savings/Wages **= S/Wp** = 20/230 = 0.087 4.35 % more
Investment/Produce **= I/GDP** = 60/460 = 0.130 2.17 % more.

ANALYSIS FOR EXAMPLE 2.

The decision-making ratios by the entities are simplified in this example. To the exogenous decision by the GOVERNMENT are added the three endogenous decisions of the entities. They are expressed by the different proportions of the total group involvement. These were previously defined by Equations (8) to (21) in Chapter 9.4. The GOVERNMENTAL (obligatory) tax change is included, since it is the cause of the redistribution process.

INPUT (ROW) DECISION-MAKING RATIOS **{horizontal blocks}**

GOVERNMENT (tax): **{δTl} = 0** , **{δTp} = 0** , **{δTc} = 0** , **{δTh} = 1**.
PRODUCER: **{δCg} = 2/3** , **{δCc} = 0** , **{δCh} = 1/3** .

These ratios are because the durables used by the PRODUCER have not yet changed with the reduced GOVERNMENT demand, with only half as much going to private consumption. These ratios satisfy Equations (8) and (10) only. The LAND-LORD, CAPITALIST and FINANCE INSTITUTION entities do not participate.

OUTPUT (COLUMN) DECISION-MAKING RATIOS **[vertical blocks]**

PRODUCER: **[δRp] = 0** , **[δHp] = 0** , **[δWp] = 1** .
HOUSE-HOLDER: **[δRh] = 0** , **[δCh] = 1** , **[δHh] = 0** , **[δS] = 0** .

These ratios satisfy Equations (13) and (14) only. The FINANCE INSTITUTION does not participate. The numerical values of many of these decision-making ratios are set at zero, so as to simplify the analysis. However, in a more realistic MESS model they also are significant and they would be used in determining the new state of equilibrium. A description of

how Example 2 is arranged to follow the decision-making criteria (of Tables 8 and 9) is provided in Chapter 11.1.

The 12 influence-coefficients due to the effects of the increments (see Chapter 11.2), are indicated by algebraic symbols having a "**d**" prefix in Matrix D3. These coefficients are shown numerically as percentages of the initial (exogenous) up-set which is taken as 100% and is indicated by a big letter **D**.

MATRIX D2.2 INFLUENCE-COEFFICIENTS (AS PERCENTAGES) FOR
EXAMPLE 2

COLUMN \ ROW OUTPUTS\INPUTS		G	F	C	L	P	H	dSUMS
GOVERNMENT	G	\	dM 0				DTh +100	dGNB +100
FINANCE INSTITUTION	F		\				dS 0	dFIC 0
CAPITALIST	C		dI 0	\	dHl 0	dHp 0	dHh 0	dCPL 0
LAND-LORD	L				\	dRp 0	dRh 0	dLRN 0
PRODUCER	P	dCg +100		dCc 0		\	dCh -50	dGDP +50
HOUSE-HOLDER	H					dWp +50	\	dY +50
TOTALS		+100	0	0	0	+50	+50	

EXAMPLE 3. THE EFFECT OF INCREASED INCOME-TAX (AND
REDUCED SAVINGS BY THE HOUSE-HOLDER)

We again consider the macro-economy of Example 1 after the
GOVERNMENT expands the public building programme by the collection of
the greater income-tax. However in this case the HOUSE-HOLDER decides
(see Table 9) to reduce his new savings by half, whilst consuming the same
amount as before.

MATRIX D3.1 INPUT/OUTPUT OF INCOME TAX INCREASED MESS

COLUMN \ ROW OUTPUTS\INPUTS	G	F	C	L	P	H	TOTALS & INCRE-MENTS
GOVERNMENT G	\	M 20	Tc 50	Tl 20	Tp 50	Th 100 +20	GNB 240 +20
FINANCE INSTITUTION F	rΣ(M) 40	\	riΣ(I) 40	0	0	S 20 -10	FIC 100 -10
CAPITALIST C	0	I 60 -10	\	Hl 60	Hp 120 +10	Hh 40	CPL 280 0
LAND-LORD L	0	0	0	\	Rp 60	Rh 20	LRN 80
PRODUCER P	Cg 200 +20	0	Cc 190	0	\	Ch 80	GDP 470 +20
HOUSE-HOLDER H	0	rsΣ(S) 20	0	0	Wp 240 +10	\	Y 260 +10
TOTALS AND INCREMENTS	240 +20	100 -10	280 0	80 0	470 +20	260 +10	

In order to meet the higher demand the PRODUCER now finds it preferable
to hire more durable capital, as well as to employ additional labour. In this
case, half of the additional cost is returned as wages and half as hire fees
for use of the greater amount of these durables. Due to this extra income,
the CAPITALIST now needs to float a smaller quantity of new shares, in
which the FINANCE INSTITUTION invests smaller sums. This is convenient,
due to the savings from the HOUSE-HOLDER being cut! Consequently
there is no need to adjust the output from the CAPITALIST.

CONSEQUENTIAL MACROECONOMICS

With this arrangement the changed activities are not all in the same places as those in Example 2. Here there is less activity by the FINANCE INSTITUTION, and more by the PRODUCER, but the overall effect, namely the magnitude of the modifications to the whole macro-economy of 20 B$, is the same as before. Due to the tax increase, only the sign of it is reversed.

Macro-economic Indicators:			Compared to Example 1.
Consumption/Wages **= Ch/Wp**	= 80/250	= 0.320	4.0 % less
Wages/Produce **= Wp/GDP**	= 250/490	= 0.510	0.09 % less
Taxes/Produce **= (GNB – M)/GDP**	= 240/490	= 0.490	4.64 % more
Savings/Wages **= S/Wp**	= 10/250	= 0.040	52.0 % less
Investment/Produce **= I/GDP**	= 50/490	= 0.102	20.07 % less .

ANALYSIS FOR EXAMPLE 3.

The simplified decision-making ratios in five of the entities are expressed by the proportions of the total group involvement. The (exogenous) GOVERNMENTAL obligatory tax is included with the input decisions, since it is the cause of the redistribution process.

INPUT (ROW) DECISION-MAKING RATIOS **{horizontal blocks}**

GOVERNMENT (tax):   **{δTl} = 0** , **{δTp} = 0** , **{δTc} = 0** , **{δTh} = 1** .
CAPITALIST: **{δHl} = 0** , **{δHp} = ½** , **{δ I) = ½** , **{δHh} = 0** .
PRODUCER: **{δCg} = 1** , **{δCc} = 0** , **{δCh} = 0** .

These ratios satisfy Equations (8) , (10) and (11) only. The LAND-LORD and FINANCE INSTITUTION entities do not participate.

OUTPUT (COLUMN) DECISION-MAKING RATIOS **[vertical blocks]**

PRODUCER: **[δRp] = 0** , **[δHp] = ½** , **[δWp] = ½** .
HOUSE-HOLDER: **[δRh] = 0** , **[δCh] = 0** , **[δHh] = 0** , **[δS] = 1** .
FINANCE INSTITUTION: **[δM] = 0** ,   **[δ I] = 1** .

These ratios satisfy Equations (13), (14) and (15). The numerical values of many of the decision-making ratios are zero. They are not used in finding the new equilibrium for these simplified cases, but in a more realistic MESS model they would be significant. A description of how Example 3 is arranged

to follow the decision-making criteria (of Tables 8 and 9) is provided in Chapter 11.1.

The 12 influence-coefficients due to the effects of the increments (see Chapter 11.2), are indicated by algebraic symbols having a "**d**" prefix in Matrix D5. These coefficients are also shown numerically as percentages of the initial up-set which is taken as 100% and is indicated by a big letter **D** .

MATRIX D3.2 INFLUENCE-COEFFICIENTS FOR EXAMPLE 3.

COLUMN \ ROW OUTPUTS\INPUTS	G	F	C	L	P	H	dSUMS
GOVERNMENT G	\	dM 0				DTh +100	dGNB +100
FINANCE INSTITUTION F		\				dS -50	dFIC -50
CAPITALIST C		dI -50	\	dHl 0	dHp +50	dHh 0	dCPL 0
LAND-LORD L				\	dRp 0	dRh 0	dLRN 0
PRODUCER P	dCg +100		dCc 0		\	dCh 0	dGDP +100
HOUSE-HOLDER H					dWp +50	\	dY +50
TOTALS	+100	-50	0	0	+100	+50	

EXAMPLE 4. THE EFFECT OF THE ADDITONAL TAX NOW BEING COLLECTED FROM GROUND-RENT (TAXATION OF LAND VALUES)

We now consider the macro-economy of Example 1 after the GOVERNMENT decides to expand the public expenditure by the same amount as for Example 3. However it does this by a reformed tax system. The additional revenue is now collected from the ground-rents (taxation of land-values), instead of by taking more income-tax from the wage-earner.

MATRIX D4.1 INPUT/OUTPUT OF LAND-VALUE TAX INCREASED MESS

COLUMN \ ROW OUTPUTS\INPUTS	G	F	C	L	P	H	TOTALS & INCRE-MENTS
GOVERNMENT G	\	**M** 20	**Tc** 50	**Tl** 20 +20	**Tp** 50	**Th** 100	**GNB** 240 +20
FINANCE INSTITUTION F	$r\sum(M)$ 40	\	$ri\sum(I)$ 40	0	0	**S** 20 +10	**FIC** 100 +10
CAPITALIST C	0	**I** 60 +10	\	**Hl** 60 -20	**Hp** 120 +10	**Hh** 40	**CPL** 280 0
LAND-LORD L	0	0	0	\	**Rp** 60	**Rh** 20	**LRN** 80 0
PRODUCER P	**Cg** 200 +20	0	**Cc** 190	0	\	**Ch** 80 +10	**GDP** 470 +30
HOUSE-HOLDER H	0	$rs\sum(S)$ 20	0	0	**Wp** 240 +20	\	**Y** 260 +20
TOTALS AND INCREMENTS	240 +20	100 +10	280 0	80 0	470 +30	260 +20	

Here the LAND-LORD is able to transfer only a smaller sum to the CAPITALIST, who needs income from a different source. Since the HOUSE-HOLDER now earns more than his greater consumption, he saves more. These sums become available for loan through the FINANCE INSTITUTION. The PRODUCER remunerates for increased activity, by paying greater wages to the HOUSE-HOLDER and by hiring more durable capital goods. These come from the CAPITALIST, whose total income is

unchanged. Consequently there will be an increase in production, in consumer goods as well as the new public works, with investment replacing some of the money previously transferred by the LAND-LORD to the CAPITALIST, as in Example 1.

Unlike Example 3, all of the indicators except tax/produce, have increased and the total economy is now stimulated by 60 B$, which is 3 times that previously.

Macro-economic Indicators: Compared to
                                                                                            Example 1.
Consumption/Wages **= Ch/Wp**   = 90/260   = 0.346   3.90 % more
Wages/Produce   **= Wp/GDP**   = 260/500 = 0.520   1.76 % more
Taxes/Produce   **= (GNB – M)/GDP** = 240/500 = 0.420   10.3 % less
Savings/Wages   **= S/Wp**   = 30/260   = 0.115   38.1 % more
Investment/Produce **= I/GDP**   = 110/500 = 0.220   71.9 % more.

ANALYSIS FOR EXAMPLE 4.

The simplified decision-making ratios in five of the entities are expressed by the proportions of the total group involvement, as defined In Chapter 9.4. The changed (exogenous) GOVERNMENT obligatory tax is included with the input decisions, since they are the cause of the redistribution process.

INPUT (ROW) DECISION-MAKING RATIOS **{horizontal blocks}**

GOVERNMENT (tax): **{δTl} = 1**   , **{δTp} = 0** , **{δTc} = 0**   , **{δTh} = 0** .
CAPITALIST: **{δHl} = 1/2**, **{δHp} = 1/4**, **{δ I } = 1/4**, **{δHh} = 0** .
PRODUCER: **{δCg} = 2/3** , **{δCc} = 0**   , **{δCh} = 1/3** .

These ratios satisfy Equations (8), (10) and (11) only. The LAND-LORD and FINANCE INSTITUTION entities do not participate.

OUTPUT (COLUMN) DECISION-MAKING RATIOS **[vertical blocks]**

FINANCE INSTITUTION: **[δM] = 0**   , **[δ I] = 1**   .
PRODUCER: **[δRp] = 0** , **[δHp] = 1/3** , **[δWp] = 2/3** .
HOUSE-HOLDER: **[δRh] = 0** , **[δCh] = 1/2** , **[δHh] = 0** , **[δS] = 1/2** .

These ratios satisfy Equations (13), (14) and (15). The numerical values of many of the decision-making ratios are zero. They are not used in finding the new equilibrium for these simplified cases, but in a more realistic MESS

model they would be significant. A description of how Example 4 is arranged to follow the decision-making criteria (of Tables 8 and 9) is provided in Chapter 11.1.

The 12 influence-coefficients due to the effects of the increments (see Chapter 11.2), are indicated by algebraic symbols having a "d" prefix in Matrix D7. These coefficients are also shown numerically as percentages of the initial up-set which is taken as 100% and is indicated by a big letter **D** .

MATRIX D4.2 INFLUENCE-COEFFICIENTS FOR EXAMPLE 4.

COLUMN \ ROW OUTPUTS\INPUTS		G	F	C	L	P	H	Dsums
GOVERNMENT	G	\	dM 0		DTI* +100			dGNB +100
FINANCE INSTITUTION	F		\				dS +50	dFIC +50
CAPITALIST	C		dI +50	\	dHl -100	dHp +50	dHh 0	dCPL 0
LAND-LORD	L				\	dRp 0	dRh 0	LRN 0
PRODUCER	P	dCg +100		dCc 0		\	dCh +50	GDP +150
HOUSE-HOLDER	H					dWp +100	\	Y +100
TOTALS		+100	+50	0	0	+150	+100	

255

SUMMARY OF THE EXAMPLES

In each example a number of macro-economic indicators were calculated. These are summarized in Table D1with additional indicators below.

TABLE D1. SUMMARY OF EXAMPLES	EXAMPLE NUMBER AND NAME, WITH INDICATOR RATIO			
INDICATOR DESCRIPTION	1. BASIC MESS	2. LESS INCOME-TAX	3. MORE INCOME-TAX	4. LAND VALUES TAX (LVT)
NAME SYMBOLS				
Consumption/Wages **Ch/Wp**	0.333	0.291	0.320	0.346
Wages/Production **Wp/GDP**	0.511	0.500	0.510	0.520
Taxation/Production **(GNB–M)/GDP**	0.468	0.435	0.490	0.420
Savings/Wages **S/Wp**	0.083	0.087	0.040	0.115
Investment/Production **I/GDP**	0.128	0.130	0.102	0.220
Capital Purchased/Prod. **Cc/GDP**	0.404	0.413	0.388	0.380
Government Purchase/Prod. **Cg/GDP**	0.426	0.391	0.449	0.440

When Examples 2 and 3 are compared to the basic condition in Example 1, it is seen that the macro-economy initially responds in different ways depending on whether the amount of taxation is lowered or raised. The effect of the change of income to the GOVERNMENT is actually detrimental to wages and total production (in Example 2) or to savings and investment (in Example 3).

However, when Example 4 is compared to the basic condition in Example 1, it is seen that the new increased taxation policy helps more of the entities to improve their conditions, whilst limiting the CAPITALIST in his control of the investments without reducing them in size. The GOVERNMENT is unaffected, but savings, production and investment all get a boost.

APPENDIX E RESTRICTIONS IN PROGRESS OF THE
PRODUCTION PROCESS –
THE "ALWAYS SOMETHING" GREMLIN

This appendix deals with the various limitations that occur during the development of human society, due to its macro-economic progress. It is found that different kinds of constraints are experienced within the community according to its size, and we will therefore consider various stages of its growth during passage from the initial condition of a small floundering pioneer settlement, to the eventual stage of a great and flourishing metropolis. During these periods of development and even after the city is well established, there is always some unwelcome kind of limitation, a kind of malevolent paradigm that always works to suppress progress.

In his seminal book, "Progress and Poverty" [8], Henry George vividly described the growth of such a community. However, his explanation does not properly explain at each stage, how the society is actually limited in respect to its growth. He does not tell how the kinds of these restricting causes change, as the numbers of people multiply and the area occupied by them increases in size. We will re-examine these difficulties by taking a remote macroeconomics view, in order to explain how these variations occur.

Consider a social group that resembles the present kinds of communities in the Western Hemisphere. Let us identify four stages in this progress: a few settlers in a sparsely populated region, a small village of about 300 people, a provincial town and a fully developed city. Various features of these degrees of settlement are described in more detail in Table E.1.

Initially there is an abundance of land but the pioneers are limited in their productive capacity by the scarcely of their numbers. Everybody works hard, but if one farmer needs to dig up a tree-root or to shift a heavy rock, he needs the assistance of many others. So **the first limitation is in man-power or labour,** anybody with a few slaves for hire is a king.

A little village springs up. There are now sufficient people to perform the more difficult kinds of farming activities. However there is only one tractor and a few ploughs and straggly draft-animals, which are needed in half a dozen places at once during the ploughing season. The tractor owner is now the one who gets rich, due to the heavy demand for his services. Then **the current limitation is in durable capital goods**. Until the farmers are able

to produce sufficient food for themselves and have a surplus to exchange for more suitable and powerful equipment, the community will remain relatively poor. Employment is not a problem in this society, anyone who is not busy in the fields or in raising domestic animals, is building himself a better house, enclosing a larger paddock or improvising on his home-made tools and tackle.

The community grows into a small town and there is no longer any limitation in manpower or equipment. The division of labour into more specialized jobs, results in greater productive efficiency and the introduction of a significant quantity of durable capital goods have had the same effect. The current problem is one of finding suitable space for the newly established farms and businesses, because **all of the choice locations have already been taken**. The agricultural produce from the latest farms on the outlying land has to be brought a considerable distance to the central markets. Consequently these goods are more costly to supply than when the same produce is grown more centrally. The original farmers soon discover the advantage of lower costs, when their prices are made equal to those of their "marginal" colleagues. The pioneers now enjoy the surplus income (over actual cost) in a raised standard of living, whilst the poorer farmers located on the fringes of the community barely scrape by. This kind of advantage of location intensifies when manufactured goods become available and commerce develops. Businesses that are located on the outskirts of the town tend to fail easily, but the sites that lie close to the factories, shops, offices and homes, are able to command for the owners some amazingly high ground-rents, compared to the outlying farm-lands. The most useful and productive land is central to the town and it has the greatest value.

Landowners are now able to speculate in this valuable resource. They would rather wait for a new highway or rail-road to be planned and for the potential usefulness that this confers on their originally acquired fields, than put this land to the plough. When they rent it out as small parcels for commercial use, the resulting income obtainable from it is hundreds if not thousands of times more in goods-value than what was previously grown by the pioneers on sites of equal size and fertility. The land-owners can do this without performing a stroke of work or employing a single labourer and his tools, although some will make token gestures to use their land in socially-justifiable ways. Eventually and inevitably these more productive sites are sold at very high prices for use in manufacture, commerce or residence. Due to land speculation, as sites become available their prices are greatly inflated, regardless of whether they are sold, leased or rented.

CONSEQUENTIAL MACROECONOMICS

Some of these most productive and valuable sites are held by monopolists who speculate in them, driving up the ground-rent and the cost of the produce (be it food, manufactured goods or rights for residence). This gift from nature now becomes vitally important to the working population, due to the increased population density and the more intensive municipal development that goes with it. From a selfish point of view, the monopolistic landowner prefers to hold the land out of use. Using it as co-lateral, he can borrow from the banks, which gladly help him to buy more of the outlying land, which is certain to rise in value with population growth and non-availability of the more central sites. When they are eventually sold, these sites provide more money than a past-generation of farmers could possibly have earned in agriculture alone.

Much of the development land is in the hands of the local authorities. The town planners and lawyers are the first to inform the banks where a new suburb is projected. Then the banks can speculate by lending money for the development of this land. The selfish non-use and speculation of this huge resource, the value of which is continuing growing, due to public investment within the community, provides the monopolists of our land with an income that in effect *is taken from the ground-rents*. This misdirection of the rent is the cause of the high prices and relative low demand of our consumer goods. The landlessness of the hired worker coupled with the low demand for his efforts, create a lack of available jobs, which then result in unemployment and poverty. Before the ground-rent became significant and nobody held-back on the use of land, there was never any unemployment.

The answer to this problem of improperly appropriated ground-rent (some of which the land owner/user does not even know about, since in effect he pays it to himself), *is to collect a proportion of it for public use*. In any case, much of the ground-rent (in the form of interest) was created by public investment in the streets, sewers, piped water, electrification, transport and emergency services. Therefore it is socially just and fitting to take this gain for public use. The effect of taxing most material goods items is to suppress them, but this doesn't happen with the land, because it is there anyway. The effect of introducing even a small amount of land-value tax would be to cause many of the speculators to sell the land to people who will use it properly and who are able to pay the community a reasonable ground-rent for the privilege.

TABLE E.1 THE DIFFERENT STAGES IN THE DEVELOPMENT OF A COMMUNITY				
FEATURE / size	PIONEERING SETTLEMENT	MODEST VILLAGE	PROVINCIAL TOWN	GREAT METROPOLIS
land fertility, for use in farming	high, most natural-resources not yet tapped, no special position	good, use of best land in farming and for the extraction of minerals	reduced, due to building developments, position is significant	low, land is largely hidden and of small interest, position is vital
available labour	unrefined, few in number, jack of all trades	basic, some division of labour	many kinds, trades and professions	wide spectrum, academics and management services
state of technology	rudimentary knowledge	working skills and crafts	coordinated, systematic	complex, universal, scientific, hi-tech
private capital investments in durable goods	bare minimum, rudimentary tools, shanty-huts	simple forms, basic tools, permanent furnished homes	well-developed, machine-tools, cars, domestic equipment, apartments	integrated system, of tall buildings, offices, with the municipal services, fleets of trucks etc.
communi-cations and transport	rare, by foot or pack-animal, paths, few tracks	occasional, simple, weekly stage-coach, few roads	regular, urban bus, canals, public system of roads/streets	frequent, arterial hi-ways, rail/sea/air, national and international
availability of produce for private consumption	very limited, basic foods, occasional famine	plain, sufficient but limited choice in the kinds of food	varied, wide choice, certain luxury items for celebrations	exaggerated, wasteful, (poverty) but no shortage in affluent homes
medicines and medical aid	almost none	crude, mostly home-remedies	general-practice doctors, standard cures, emergency wards	Refined, hospitals, medical experts for real and imagined ailments
facilities for exchange	back-door trading, barter, promises, but little use for money	small-scale, shops, tinkers, inter-village traders, money, promissory-notes	planned markets, shops and trade-centres, banks,	Multi-departmental stores, by mail, shopping-malls, conglomerates
education	learning by trial and error	one-room, single teacher	schools and training classes	university, and special college

FEATURE / size	PIONEERING SETTLEMENT	MODEST VILLAGE	PROVINCIAL TOWN	GREAT METROPOLIS
TABLE E.1 continued **THE DIFFERENT STAGES IN THE DEVELOPMENT OF A COMMUNITY**				
effect of land ownership on leaders	insignificant, but provides focus	head-man, mayor status	baronial, at least one industrial monopolist	political-powers, "empire-builders", commercial chains
Population	5 /sq.km	50 /sq.km	500 /sq.km	5,000 /sq.km
entertainment	self-generated	public tavern, troubadour	clubs and bars, through religion and cinema	T.V., theatre, opera, rock and symphony concert
the law (and it enforcement)	none (none needed)	the sheriff (is the law)	by constabulary (and magistrate)	police force (and judicial courts)
the growth-limitations "gremlin"	insufficient people for consistent production	inefficient, few durable capital goods for use in production	land-value speculation, rack-rents, wide marginal utility	land monopoly and unavailability, high production/ housing costs due to rent

APPENDIX F. LIST OF CIRCUITS AND DIAGRAMS FOR DETERMINING MULTIPLIERS

F1. <u>LIST OF MUTUAL-FLOW CIRCUITS</u>

In the table all 46 kinds of these circuits are shown. They are based on the output money-flows and they fall into 5 categories, depending on the number of entities involved. For each circuit the entities are listed in a specific order, the starting point being arbitrary. The associated money-flows between the entities are compiled on the right-hand side. Were input flows used instead, the resulting circuits would be the same.

<u>LIST OF ENTITIES IN ORDER (OUTPUT)</u>		<u>ASSOCIATED MONEY-FLOWS</u>
6-Entity Circuits (7 kinds)		
L G P C F H L	01	Tl **Cg** **Hp** ri∑(I) rs∑(S) **Rh**
L G F H C P L	02	Tl **r∑(M)** **rs∑(S)** **Hh** **Cc** **Rp**
L G F C P H L	03	Tl **r∑(M)** I **Cc** **Wp** **Rh**
L C F H G P L	04	Hl ri∑(I) rs∑(S) **Th** **Cg** **Rp**
L C F G P H L	05	Hl ri∑(Ī) **M** **Cg** **Wp** **Rh**
L C G F H P L	06	Hl **Tc** r∑(M) rs∑(S) **Ch** **Rp**
L C P G F H L	07	Hl **Cc** Tp r∑(M) rs∑(S) **Rh**
5-Entity Circuits (12 kinds)		
L G F H P L	08	Tl **r∑(M)** **rs∑(S)** **Ch** **Rp**
L G F C P L	09	Tl **r∑(M)** I **Cc** **Rp**
L C F H P L	10	Hl ri∑(Ī) **rs∑(S)** **Ch** **Rp**
L C F G P L	11	Hl **r∑(I)** **M** **Cg** **Rp**
L C G F H L	12	Hl **Tc** r∑(M) rs∑(S) **Rh**
L C G P H L	13	Hl **Tc** **Cg** **Wp** **Rh**
G P H F C G	14	**Cg** **Wp** **S** **I** **Tc**
G P H C F G	15	**Cg** **Wp** **Hh** ri∑(I) **M**
G P C F H G	16	**Cg** **Hp** ri∑(Ī) **rs∑(S)** **Th**
G F H P C G	17	r∑(M) rs∑(S) **Ch** **Hp** **Tc**
G F H C P G	18	r∑(M) rs∑(S) **Hh** **Cc** Tp
G F C P H G	19	r∑(M) **I** **Cc** **Wp** Th

LIST OF ENTITIES IN ORDER (OUTPUT)		ASSOCIATED MONEY-FLOWS
4-Entity Circuits (13 kinds)		
L G P H L	20	**Tl Cg Wp Rh**
L G F H L	21	**Tl r∑(M) rs∑(S) Rh**
L C F H L	22	**Hl ri∑(I) rs∑(S) Rh**
L C G P L	23	**Hl Tc Cg Rp**
L C P H L	24	**Hl Cc Wp Rh**
G P H F G	25	**Cg Wp S M**
G P H C G	26	**Cg Wp Hh Tc**
G P C F G	27	**Cg Hp ri∑(I) M**
G F H P G	28	** r∑(M) rs∑(S) Ch Tp**
G F H C G	29	** r∑(M) rs∑(S) Hh Tc**
G F C P G	30	** r∑(M) I Cc Tp**
C F H P C	31	** ri∑(I) rs∑(S) Ch Hp**
C P H F C	32	**Cc Wp S I**
3-Entity Circuits (8 kinds)		
L C P L	33	**Hl Cc Rp**
L G P L	34	**Tl Cg Rp**
G P H G	35	**Cg Wp Th**
G P C G	36	**Cg Hp Tc**
G F H G	37	** r∑(M) rs∑(S) Th**
G F C G	38	** r∑(M) I Tc**
H C P H	39	**Hh Cc Wp**
H C F H	40	**Hh ri∑(I) rs∑(S)**
2-Entity Circuits (6 kinds), see also Table 6		
G P G	41	**Cg Tp**
G F G	42	** r∑(M) M**
H P H	43	**Ch Wp**
H F H	44	**S rs∑(S)**
C P C	45	**Cc Hp**
C F C	46	** ri∑(I) I**

F2. CIRCUIT DIAGRAMS FOR DETERMINING MULTIPLIER FACTORS

Based on each pivotal money-flow in turn, the full set of possible circulations is shown below. To illustrate these flows, a compact form of Figure 1 is drawn with the relevant flows included. The circuit number and list of entities are given on the right-hand side, these data being extracted from the above table. It is noted that:

   a) many of the shorter circuits miss out certain loops that occur in the longer circuits   between a larger number of entities and
   b) some of the circuits have money-flows that are in the opposite direction to the same flows from other situations.

PIVOTAL MONEY-FLOW **Th**
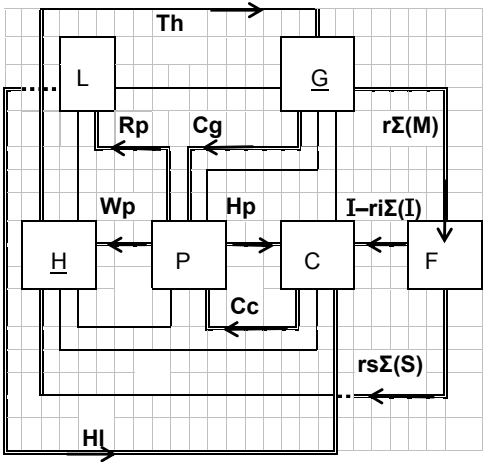
ALL OF THE POSSIBLE MONEY-
FLOW CIRCUITS

04	H	G	P	L		C	F		H
16	H	G	P			C	F		H
19	H	G					F	C P	H
35	H	G						P	H
37	H	G					F		H

CONSEQUENTIAL MACROECONOMICS

ALL OF THE POSSIBLE MONEY-FLOW
CIRCUITS
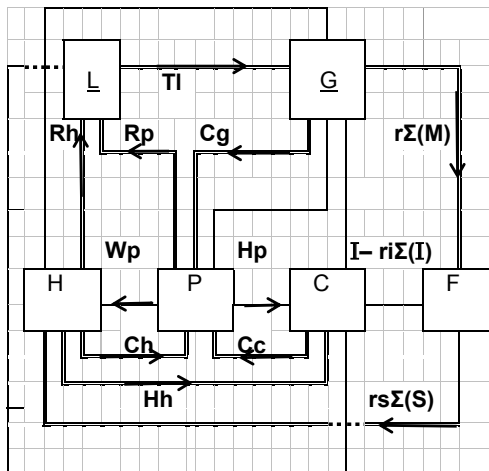
01	L	G	P	C	F			H			C		P		L

01 L G P C F   H   L
02 L G   F   H C P L
03 L G   F C P H   L
08 L G   F   H   P L
09 L G   F C   P L
20 L G P   H   L
21 L G   F   H   L
34 L G P   L

PIVOTAL MONEY-FLOW **Tp**

ALL OF THE POSSIBLE MONEY-FLOW
CIRCUITS
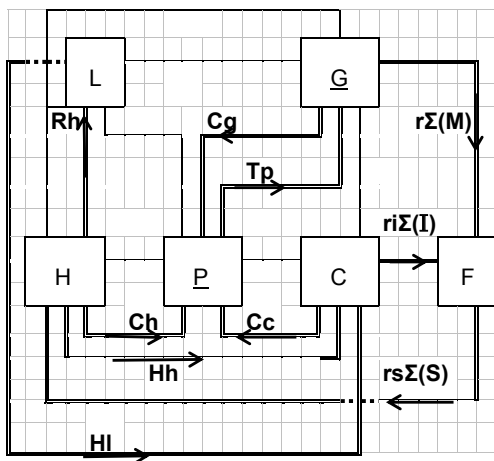
07 P G F H   L C P
18 P G F H   C P
28 P G F H   P
30 P G F   C P
41 P G   P

265

Rationalizing About How Our Social System Works

PIVOTAL MONEY-FLOW Tc
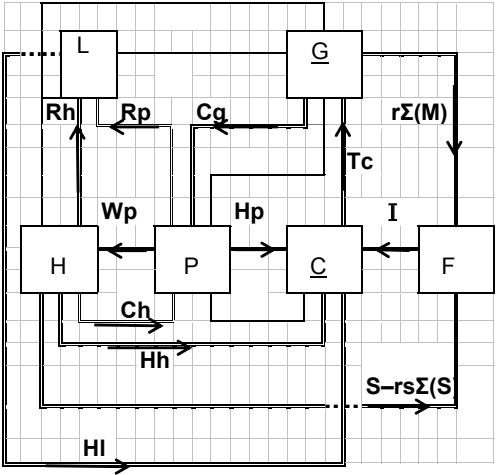
ALL OF THE POSSIBLE MONEY-FLOW CIRCUITS

```
06   C G       F H P       L C
12   C G       F H         L C
13   C G P     H           L C
14   C G P     H     F     C
17   C G       F H P       C
23   C G P               L C
26   C G P     H           C
29   C G       F H         C
36   C G P                 C
38   C G             F     C
```

PIVOTAL MONEY-FLOW Rh
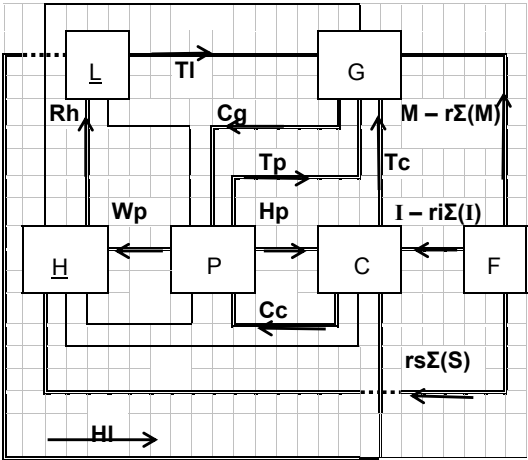
ALL OF THE POSSIBLE MONEY-FLOW CIRCUITS

```
01   H L G          P   C F   H
03   H L G     F        C   P H
05   H L   C F     G       P H
07   H L   C   P G     F   H
12   H L   C         G   F   H
13   H L   C         G   P H
20   H L G          P       H
21   H L G     F            H
22   H L   C             F   H
24   H L   C             P H
```

266
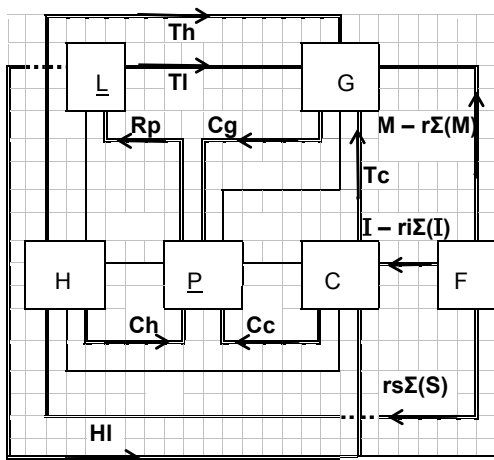
CONSEQUENTIAL MACROECONOMICS

02	P	L	G		F	H			C		P
04	P	L		C	F	H				G	P
06	P	L		C			G	F	H		P
08	P	L	G			F	H				P
09	P	L	G		F				C		P
10	P	L		C				F	H		P
11	P	L		C				F		G	P
23	P	L							C	G	P
33	P	L							C		P
34	P	L								G	P
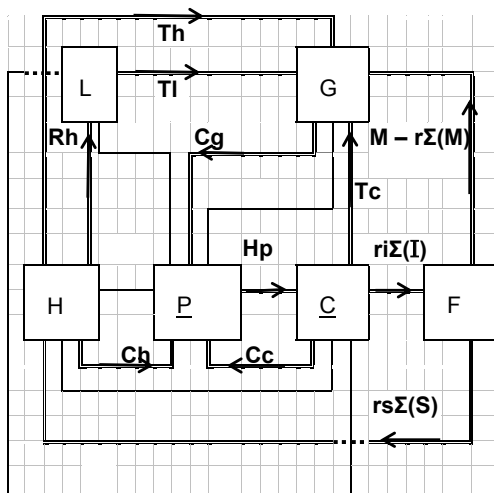
01	P	C		F	H	L	G	P
16	P	C		F	H		G	P
17	P	C	G	F	H			P
27	P	C		F			G	P
36	P	C					G	P
45	P	G						P

267

Rationalizing About How Our Social System Works

PIVOTAL MONEY-FLOW Hh

L   G   Tl   M − rΣ(M)   Rp   Cg   Tp   Tc   Wp   riΣ(I)   H   P   C   F   Cc   Hh   rsΣ(S)
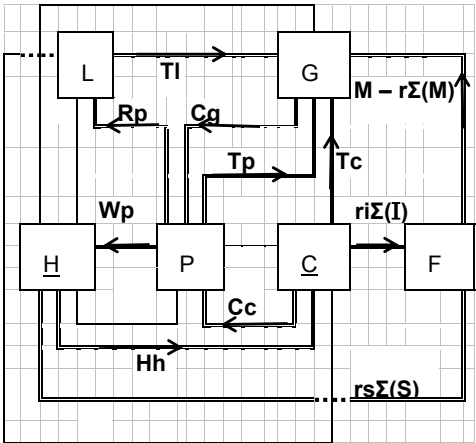
ALL OF THE POSSIBLE MONEY-FLOW CIRCUITS

02	H	C		P	L	G		F	H
15	H	C	F			G	P		H
18	H	C		P		G		F	H
26	H	C				G	P		H
29	H	C				G		F	H
39	H	C		P					H
40	H	C						F	H

PIVOTAL MONEY-FLOW Hl

Th   L   G   M − rΣ(M)   Rh   Rp   Cg   Tp   Tc   Wp   riΣ(I)   H   P   C   F   Ch   Cc   rsΣ(S)   Hl
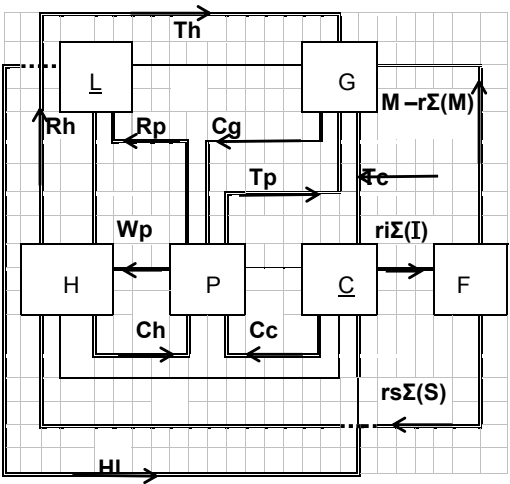
ALL OF THE POSSIBLE MONEY-FLOW CIRCUITS

04	L	C	F					H	G	P	L
05	L	C	F	G	P			H			L
06	L	C		G			F	H		P	L
07	L	C			P	G	F	H			L
10	L	C	F					H		P	L
11	L	C	F						G	P	L
12	L	C				G	F	H			L
13	L	C		G	P			H			L
22	L	C	F					H			L
23	L	C		G	P						L
24	L	C			P			H			L
33	L	C								P	L

CONSEQUENTIAL MACROECONOMICS

PIVOTAL MONEY-FLOW **Wp**
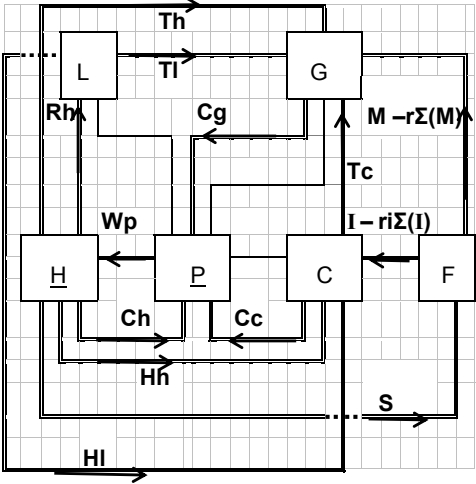
ALL OF THE POSSIBLE MONEY-
FLOW CIRCUITS

03	P	H	L	G		F	C			P
05	P	H	L		C	F			G	P
13	P	H	L		C				G	P
14	P	H				F	C		G	P
15	P	H			C	F			G	P
19	P	H		G		F	C			P
20	P	H	L						G	P
24	P	H	L				C			P
25	P	H				F			G	P
26	P	H					C		G	P
32	P	H				F	C			P
35	P	H		G						P
39	P	H					C			P
43	P	H								P

PIVOTAL MONEY-FLOW **Ch**
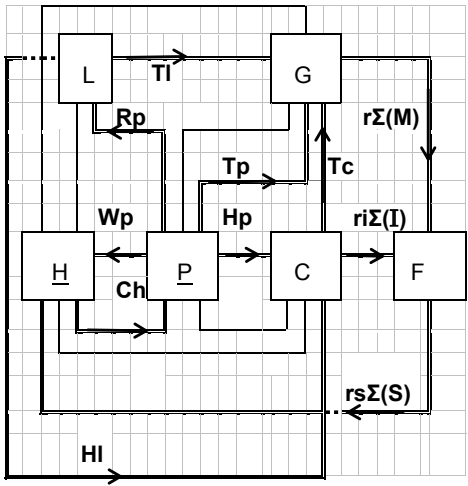
ALL OF THE POSSIBLE MONEY-
FLOW CIRCUITS

06	H	P	L	C	G	F	H
08	H	P	L		G	F	H
10	H	P	L	C		F	H
17	H	P		C	G	F	H
28	H	P			G	F	H
31	H	P		C		F	H
43	H	P					H

269

Rationalizing About How Our Social System Works

PIVOTAL MONEY-FLOW Cc

Diagram labels: Th, Tl, L, G, Rh, Rp, rΣ(M), Tp, Wp, Hp, I, H, P, C, F, Cc, Hh, S–rsΣ(S), Hl
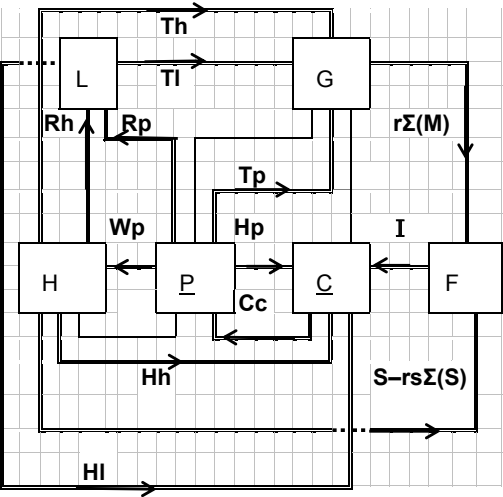
ALL OF THE POSSIBLE MONEY-FLOW CIRCUITS

No.	C	P							C
02	C	P		L	G	F	H		C
03	C	P	H	L	G	F			C
07	C	P			G	F	H	L	C
09	C	P		L	G	F			C
18	C	P			G	F	H		C
19	C	P	H		G	F			C
24	C	P					H	L	C
30	C	P			G	F			C
32	C	P	H			F			C
33	C	P						L	C
39	C	P					H		C
45	C	P							C

PIVOTAL MONEY-FLOW Cg

Diagram labels: Th, Tl, L, G, Rh, Rp, Cg, M, Tp, Tc, Wp, Hp, I– riΣ(I), H, P, C, F, Hh, S–rsΣ(S), Hl
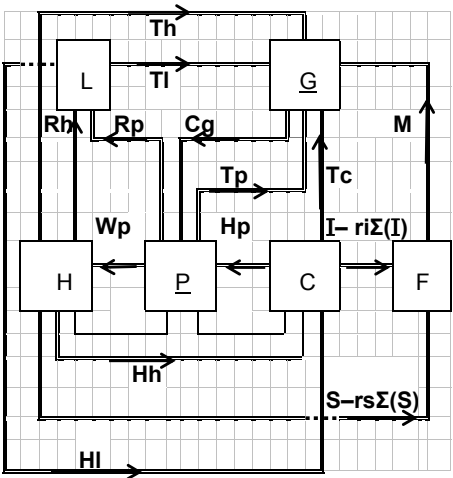
ALL OF THE POSSIBLE MONEY-FLOW CIRCUITS

No.	G	P							G
01	G	P	C	F	H	L			G
04	G	P	L	C	F	H			G
05	G	P			H	L	C	F	G
11	G	P				L	C	F	G
13	G	P			H	L		C	G
14	G	P			H		F	C	G
15	G	P			H		C	F	G
16	G	P	C	F	H				G
20	G	P			H	L			G
23	G	P				L	C		G
25	G	P			H			F	G
26	G	P			H			C	G
27	G	P					C	F	G
34	G	P				L			G
35	G	P			H				G
36	G	P						C	G
41	G	P							G

CONSEQUENTIAL MACROECONOMICS

PIVOTAL MONEY-FLOW **M**
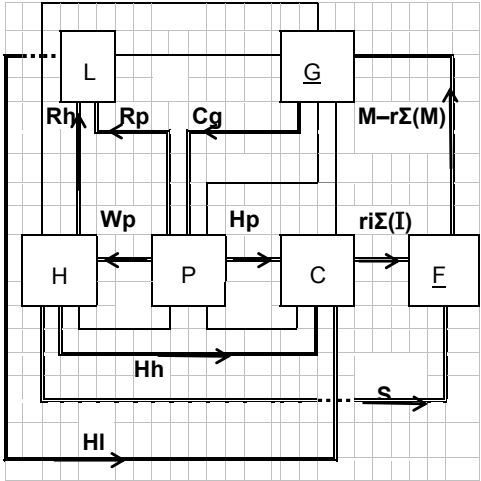
ALL OF THE POSSIBLE MONEY-FLOW CIRCUITS

05	F	G	P	H	L	C	F
11	F	G	P		L	C	F
15	F	G	P	H		C	F
25	F	G	P	H			F
27	F	G	P			C	F
42	F	G					F

PIVOTAL MONEY-FLOW rΣ(M)
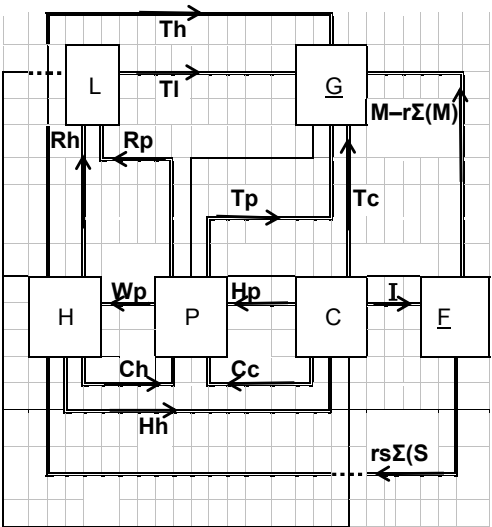
ALL OF THE POSSIBLE MONEY-FLOW CIRCUITS

02	G	F	H		C	P		L	G
03	G	F		C	P		H	L	G
06	G	F	H		P	L		C	G
07	G	F	H	L	C	P			G
08	G	F	H		P			L	G
09	G	F		C	P			L	G
12	G	F	H	L				C	G
17	G	F	H		P		C		G
18	G	F	H	C	P				G
19	G	F		C	P		H		G
21	G	F	H	L					G
28	G	F	H		P				G
29	G	F	H	C					G
30	G	F		C	P				G
37	G	F				H			G
38	G	F		C					G
42	G	F							G

Rationalizing About How Our Social System Works

PIVOTAL MONEY-FLOW I

Th · Tl · L · G · Rh · Rp · Cg · rΣ(M) · Tp · Tc · Wp · I– riΣ(I) · H · P · C · F · Cc · S
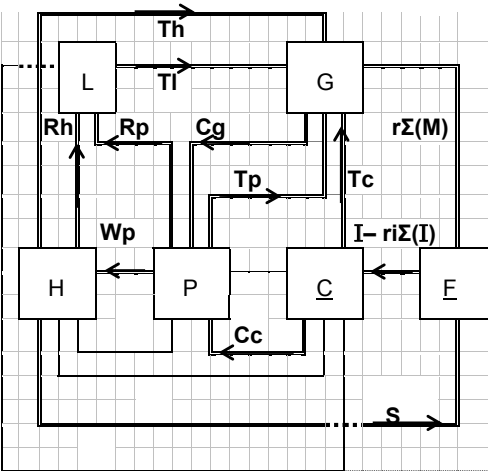
	F	C	G	P	H	L	G	F
03	F	C		P	H	L	G	F
09	F	C		P		L	G	F
14	F	C	G	P	H			F
19	F	C		P	H		G	F
30	F	C		P			G	F
32	F	C		P	H			F
38	F	C					G	F
46	F	C						F

PIVOTAL MONEY-FLOW riΣ(I)

Th · Tl · L · G · Rh · Rp · Cg · M · Wp · Hp · I– riΣ(I) · H · P · C · F · Ch · Hh · rsΣ(S) · Hl
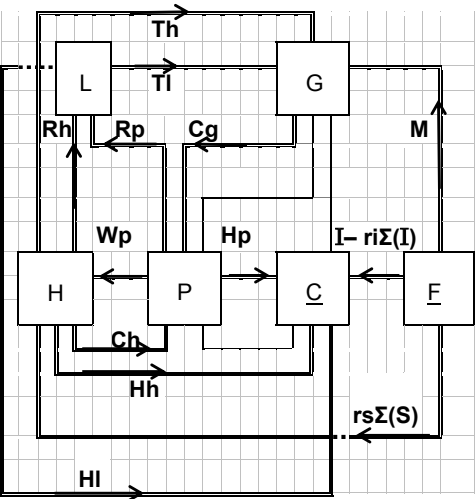
ALL OF THE POSSIBLE MONEY-FLOW CIRCUITS

	C	F	H	L	G	P	H	L	C
01	C	F	H	L	G	P			C
04	C	F	H		G	P		L	C
05	C	F			G	P	H	L	C
10	C	F	H			P		L	C
11	C	F			G	P		L	C
15	C	F			G	P	H		C
16	C	F	H		G	P			C
22	C	F					H	L	C
27	C	F			G	P			C
31	C	F	H			P			C
40	C	F					H		C
46	C	F							C

272

CONSEQUENTIAL MACROECONOMICS
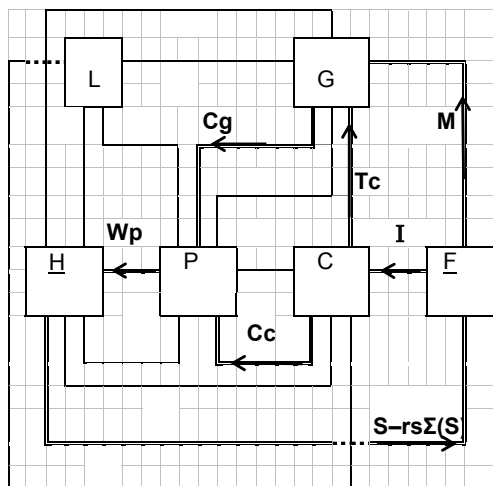
ALL OF THE POSSIBLE MONEY-FLOW CIRCUITS

14	H	F	C	G	P	H
25	H	F		G	P	H
32	H	F	C		P	H
44	H	F				H

PIVOTAL MONEY-FLOW **rs∑(S)**

ALL OF THE POSSIBLE MONEY-FLOW CIRCUITS

01	F	H	L	G		P		C		F
02	F	H			C	P	L		G	F
04	F	H		G		P	L	C		F
06	F	H				P	L	C	G	F
07	F	H	L		C	P			G	F
08	F	H				P	L		G	F
10	F	H				P	L	C		F
12	F	H					L	C	G	F
16	F	H		G		P		C		F
17	F	H				P		C	G	F
18	F	H			C	P			G	F
21	F	H	L						G	F
22	F	H	L					C		F
28	F	H				P			G	F
29	F	H						C	G	F
31	F	H				P	C	C		F
37	F	H					C		G	F
40	F	H						C		F
44	F	H								F

273

F3. <u>SUMMARY</u>

SUMMARY OF THE POSSIBLE CIRCULATIONS BASED ON THE 19 MONEY-FLOWS									
MONEY-FLOW BASE (FROM TABLE 3)				OCCURRENCES IN CIRCUITS HAVING THE NUMBER OF ENTITIES					
DESCRIPTION OF FLOW	SYMBOL	ENTITY FROM/TO							
				6	5	4	3	2	TOTAL
Tax on Personal Income	**Th**	H	G	1	2	0	2	0	5
Tax on Land-Value (Revenue)	**Tl**	L	G	3	2	2	1	0	8
Tax on Purchases (V.A.T.)	**Tp**	P	G	1	1	2	0	1	5
Tax on Property (Durable Goods)	**Tc**	C	G	1	4	3	2	0	10
Ground-Rent (on Residential Land)	**Rh**	H	L	4	2	4	0	0	10
Ground-Rent (on Productive Land)	**Rp**	P	L	3	4	1	2	0	10
Yield, within the Productive Process	**Hp**	P	C	1	2	1	1	1	6
Hire-Fees (Domestic)	**Hh**	H	C	1	2	2	2	0	7
Organized Money-Transfer	**Hl**	L	C	4	4	3	1	0	12
Wages (Gross Earnings)	**Wp**	P	H	2	4	5	2	1	14
Purchases (Consumption)	**Ch**	H	P	1	3	2	0	1	7
Capital Outlay (True Investments)	**Cc**	C	P	3	3	3	2	1	12
National Appropriations	**Cg**	G	P	3	5	5	3	1	17
Bank Loans for Re-Circulation	**M**	F	G	1	2	2	0	1	6
Interest on Bonds	**r∑(M)**	G	F	4	6	4	2	1	17
'Investments" (and Mortgages)	**I**	F	C	1	3	2	1	1	8
Dividends on Investments	**ri∑(I)**	C	F	3	4	3	1	1	12
Savings (and Outgoing Loans)	**S**	H	F	0	1	1	1	0	3
Interest on Savings	**s∑(S)**	F	H	5	6	5	2	1	19

APPENDIX G THE THEORY OF LAND-VALUES AND THE VARIANCE IN ITS BEHAVOUR COMPARED TO DURABLE CAPITAL GOODS

The macro-economic term "land-value" applies to the actual sites, plots or areas of ground, without buildings or other artificial improvements, even though these features may be in place. The value of a site is due to *the potential opportunity for utilization that the land endows its owner.* For a tenant, this opportunity is directly expressed as the ground-rent, which is related to the land-value. The land-value is also determined during trading, when the selling-cost and the buying-price are equal, due to the duality principle in macroeconomics (see Chapter 16). As communities develop and their regional statuses rise, there is a consequential increase in their land-values, the implications of which follow.

In the introductory section G.1, a review is made of the broad range of uses to which the classes of land can be put and the effect of changes in its status. Section G.2 explains the cause of the ground-rent and how the land-value is derived from it. Section G.3 compares the way that macro-economic investment in land behaves and differs from that of durables, and in section G.4 a summary of the analysis is given with conclusions.

G.1 THE USES AND ABUSES OF THE LAND

In general, the land may be used for many different purposes, laying within three broad classes and two kinds of localities. The associated categories are shown in Table G.1 (on next page). Except for the last 4 uses, these categories of land have been roughly graded from the least to the most useful. As one goes from regions of wilderness to populated regions, the land-values progressively increase. A contour map of land-values has a zero-value line where the land is marginal. Beyond this contour are swamps, deserts and mountain tops, where nothing useful is produced and nobody lives nor works. Passing from there over a series of contour-lines of progressively increasing value, one eventually reaches the city centres, where the short-length contours enclose the land having the greatest productivity and highest value.

TABLE G.1 CLASSIFICATION OF THE LAND BY ITS USE		
CLASS	LOCALITY	LAND STATUS - CATEGORY, WITH EXAMPLES
Productive	Rural	1 <u>Forestry</u> - growth of timber, soil conservation. 2 <u>Pastoral</u> - grazing of cattle. 3 <u>Extensive Agriculture</u> – un-irrigated crops, 4 <u>Intensive Farming</u> - irrigated crops, market-gardens, orchards, vineyards, green-houses, paddy-fields, dairies, enclosed animals, fish-ponds, produce stores, etc.
	Urban	5 <u>Industrial</u> - manufacture of goods, building construction. 6 <u>Commercial</u> - shops and markets, offices, hotels, warehouses, restaurants, social and entertainment centres, casinos, banks, garages and other services.
Residential	Urban	7 <u>Domestic</u> - houses, rest-homes and refuges.
Public	Urban or Rural	8 <u>Recreational</u> - sports and holiday centres, parks, fun-fair grounds, zoological and botanical gardens.
		9 <u>Municipal Service</u> - hospitals, social and health centres, public baths, waste and water storage and treatment plants, schools and training faculties, libraries, museums, emergency services, law enforcement and detention centres, cemeteries and places of worship.
		10 <u>Communications</u> - telegraph and post-offices, radio and T.V. studios and transmitters, telephone exchanges.
		11 <u>Transport</u> - roads, highways, bridges, under-passes, car-parks, railways, rivers, canals, footways, cycle- paths, bus-stations, air/sea ports, docks and wharves.
		12 <u>Government</u> – administration and meeting centres.
		13 <u>Protected</u> - nature reserves and bird sanctuaries.
		14 <u>Energy</u> - Power generating stations, electrical sub-stations and distribution lines, gas and oil refineries.
Public and National		15 <u>Military</u> - camps, airfields and training grounds.
		16 <u>Knowledge</u> – higher education and research centres.

CONSEQUENTIAL MACROECONOMICS

G.1.1 Effect of Changes in Land Status - Speculation and Economic
Activity

The rural land, which surrounds an expanding community, is progressively converted into urban use. The areas involved then change status, followed by a rapid rise in the value of each of the associated sites. The same thing happens whenever a small town is connected to a national transport system, such as a railway. Immediately there is an increase in the value of the sites in the area, which lie near the proposed railhead, ports, etc. Land speculators take advantage of these changes by obtaining advance information about the expected development (which has its price, too). They purchase the sites that will be needed. Alternately, having already invested cheaply in sites on outlaying areas, the speculators manage to bribe the local authority into developing these areas, so as to boost the value of their resent acquisitions.

These speculative actions exploit the improved status and earning power that the investment of public money gives to the community. In effect, the authority hands-out to the speculators an increase in their site's utility and thereby raises their land-values. But even without deliberate land speculation, the same thing continuously occurs. For example, the gradual establishment and improvement of schools, shops, offices and cafes in a residential neighbourhood, enhances the status of many sites in the locality, raising the selling-price that a particular home will eventually bring to its owner.

Thus the land that is purchased ahead of such developments, directs money into the speculators' pockets, from where it is used to purchase consumer goods or for more investment. Whilst being unjust micro-economically, this re-distribution in itself does not significantly alter the macro-economic tempo of the community. Unfortunately, the land-lords also tend to monopolize their access rights. They are more interested in the gains from their speculative dealings than in running efficient businesses, which take time and effort to establish. Land being withheld in this manner is not properly used, if at all. The remaining available sites become more expensive, due to the keener competition for their access rights. Then the ground-rents rise, as does the cost of making and distributing the produce. This results in higher prices and a corresponding reduction in the total amount of macro-economic activity.

These are additional adverse effects due to speculation in land-values. With less available land, the poorer house-holders move and occupy the more-remote sites having lower utility, and the local authority finds itself using more of the municipal taxes for building and maintaining the necessary roads, sewers, etc. (By avoiding an increase of local taxation, the sociological

benefits probably would be reduced, with an associated raise in the crime rate etc.) This unwholesome situation also lengthens rush-hour traffic-jams, worsens transport costs and eventually it increases the amount of unemployment, as described above. The standard of living drops within the region and the degree of poverty grows. Thus, land speculation on numerous valuable but unused sites causes this condition of stagflation to occur, (in contradiction to the inflation/employment theory of A.W.H. Philips [15]). The progress of the now wastefully sprawled expanded communities has been significantly retarded.

In extreme cases, the monopolistic power of land ownership is so widespread that the tenants have nowhere else to live. The rack-rents, which the mercenary land-lords can then extract from these workers, comprise most of their earnings. Thus land monopolization is able to reduce the conditions of these serfs, to a state that is worse than slavery. The subject of ground-rent is discussed in greater detail below.

G.2 THE BASIS FOR THE LAND HAVING VALUE

In common with items of goods which are produced by human exertion, the value of a site (that is created without direct labour), also is expressed by its market-value. This is determined by an equalization (or mutual agreement) between the demand-price provided by the buyer (on gaining the rights of access to the site), and the supply-cost required by the seller (on the loss of this opportunity). This action of exchange disregards the use for which the buyer intends to put the land, including that of speculation. Affirming that land has an exchange value however, does not properly explain how it arises in the first place. To do so, it is necessary to examine the role that the land plays within our macro-economic society.

G.2.1 What Creates the Utility of Land

Before anyone comes to live in a region, the land is useless, due to the absence of occasion or desire to exploit its bounty. (The richest lode of gold is worthless before its discovery, or even after it is known but remains inaccessible.) Once it is occupied however, the land is the natural resource that provides the means and opportunity for the production of goods and the supply of services. It is the common base for agricultural, industrial, commercial, recreational, residential and governmental activities. However, the natural resources offered by a site, is only one of two factors causing it to

have utility, a characteristic that is subsequently expressed by its exchange-value, as noted above.

With population growth, a site's usefulness increases, due to its improved capacity for access and communications. This opportunity is created without a particular site needing to be worked or any improvement being installed on it. Consequently, both the space and the place that it occupies are significant and the utility of the site is determined only when these two factors are combined. The necessary aspects of these general factors are shown in Tables G.2a and G2b, with examples. When both kinds of the listed beneficial aspects are abundant, the site offers good opportunities for intensive utility, the collection of large ground-rents and the premium class values of the land itself. These last two characteristics will be discussed in the subsequent sections.

TABLE G.2a THE "SPACE-FACTOR" ASPECTS OF SITE UTILITY

a1] The Natural and Physical Properties of the Site

(i) Geographic - the land size, shape, location and altitude.
(ii) Climatic - day and night temperatures, humidity, daily sunshine, rain-fall, hail, snow, high winds, heavy storms and the probability of natural disasters.
(iii) Adaptability - the amount of swamp, rocks, saltiness or acidity of the soil, necessitating labour to make the land useful for a specific purpose.

a2] The Natural Bounty Within the Site

(i) Materialistic – the extent of mineral deposits (solid, liquid or gaseous), botanical and zoological content on the surface. The intensity of the sunlight, quantity of fresh air, wind, hydraulic and geothermal energy and space available above and below it.

a3] The Natural Topology of the Surrounding Region

(i) The proximity of water - the distance to lakes, rivers, canals and the
sea.
(ii) The slope and hilliness of the whole area and the ease of passage on
it.

TABLE G.2b THE "PLACE-FACTOR" ASPECTS OF SITE UTILITY

    b1] <u>The Population and Communal Development Within the Region</u>

(i)   <u>Population</u> – density, age distribution, family size and labour fraction.
(ii) <u>Quality of Life</u> - general schooling and education, health standards, foreign-workers' wages and unemployment, poverty, drug-addictions, accident and crime rates.
(iii) <u>Communal Development</u> – due to investment by house-holders, producers, banks, traders, and the local and National Government. It includes the proximity of markets and the availability and cost of using public utilities and facilities necessary for the production process, including the transport of goods and of workers between their work-place and their homes and to places of interest.
(iv) <u>External Material Sources</u> - need for and availability of raw materials (incapable of being prepared on-site) or of partly-made goods (from other producers).
(v) <u>Artificial External Disadvantages</u> – disturbance from noise, pollution, cosmic radiation (due to ozone loss) and the possibility of terrorism, revolution or war.

b2] <u>The Extent of Governmental Influence over the Region</u>

(i) <u>Land Authority</u> – which planning permission is needed and its delay in being implemented. Regulations limiting the size of buildings or the use of heavy equipment and the amount of noise/pollution during construction and later use.
(ii) <u>Local Economic Advantages</u> - free-trade zone, simplified or abandoned licensing procedures. Amenability of the local authority to bribes for information about a planned development, or for directing it to certain places. Subsidized use of capital and consumer goods and services etc.

It is of interest to note that according to the land laws in the Bible, in chapter 25 of Leviticus, that the value of a field was determined according to the volume of barley needed to sow it, so as to obtain a full crop. A specific multiplication factor was then used for converting this quantity into a sum of money. Due allowance was subsequently made, for the proportion of time remaining before the next Jubilee, when in normal circumstances the access rights to the field would automatically return to its owner. That is to say, the

lease-value (or total ground-rent of up to 49 years) was calculated according to **the utility that a prospective lease-holder could reasonably expect**.

Parts of a field that were mortgaged (for purposes of contributing to the Temple sacrifices), were valued in the same way, but their redemption was more difficult. This early basis for determining the land-value has similarities with the method used here.

G.2.2 The Utility of Residential Land

The difference between industrial or commercial land and that used for residence is that no formal production process occurs in the last case. The residual land provides the space for housing, its primary economic role being to lodge the workers, thereby enabling them to recover their working strength. Also most workers share their houses with dependants, whom they support. Their homes often contain additional rooms and grounds to allow for diverse and vital family activities to take place, which are regarded here as being enjoyable non-exchangeable consumer-services. The gratification of these human needs falls within the same class of economic functions as the provision of consumer goods, for which the utility of the land comprises an essential part. When all the residential land areas are considered, their optimal use is not a general requirement, although the making the most of one's home-acre is a commonly taken attitude.

Instead of it arising directly from the production of goods, the criterion for determining the utility of residential land comes from social pressure and the satisfactory supply of the various home services. The more expensive and desirable residential sites are usually in well-developed localities away from noisy, crowded or polluted living conditions. These criteria are not fixed - the choice of the more fashionable (and potentially useful) places to live can vary with time, often moving away from the centres where former generations dwelt. Thus, the utility of the residential land varies from zero to the most expensive and it behaves similarly to land used in production. Residential sites require more municipal development around them than agricultural districts or industrial zones. Consequently these sites are more expensive per unit area, although their average population density is greater and they are seen here as being more productive.

G.2.3 The Utility of Public Land

There is no doubt that land used in this manner has utility too. The communal nature of the associated activities means that the locations of these sites are

close to the centres of the population, in places where the use of the land for other purposes would certainly be advantageous. However, the only way to determine the utility here would be to consider a change in category of the land when it fulfils another urban role. But in any case the value of the public land is unimportant, since no ground-rent is collected in practice and its sale is usually prohibited by law.

G.2.4 Changes in the Utility Due to Investment

As seen from Tables G.2a and G.2b, the utility of a plot of land is independent of the amount of durable capital goods that has been established on it. However, one class of land exists that is not completely independent of prior investment. This is when poor agricultural sites can be improved to a limited extent by the local expenditure of labour directly on them. Then the productivity is raised by such pioneering actions as the clearing of stones, uprooting of trees and the draining of swamps. In this situation the investment of labour permanently excludes unwanted natural elements or rearranges them. It is not building in the true constructive sense; the deficient land gains utility and it becomes equivalent to similar land that was not adversely affected. It is as if nature had previously invested a negative amount of capital in the low-productive sites. Within a region, land of equal utility per unit area, must be of equal economic value, regardless of how it was formed.

Except for this category of land, the introduction of durable capital (by using labour) on a specific site does not affect its basic potentiality for use. Care in definition is needed here. The raising of dikes to keep out floodwaters or the terracing of hillsides to trap the soil, are excluded from this category of land. Both of these kinds of (capital) investments are impermanent, for they will depreciate with time and require maintenance.

G.2.5 Ground-Rent - As an Expression of "Supra-Marginal" Utility

Within the prevailing macro-economic environment, the utility of the land is normally fully exploited by its user. He/she takes the greatest economic advantage that the site is able to offer, combining its productivity (in the most useful land status that local conditions allow), with optimal quantities of labour and "capital". The latter are the durable goods, which are invested in the production facilities. In a micro-economic sense the capital can also consist of partly worked materials or input data, unless these are extracted, collected or generated directly. In this way, the land user makes the necessary effort in

producing and distributing competitive and saleable goods or in supplying marketable services (sometimes in the form of output information).

To appreciate the relationship of utility to land-value, one must first introduce the concept the economic ground-rent. This is the regular sum that the owner of a plot of land can reasonably demand for its access rights, were a tenant prepared to make the best use of this opportunity. (Although we know that the market is not freely competitive and there is some land speculation, any discussion about the payment of smaller ground-rents for the sub-optimal use of monopolized sites is irrelevant, when trying to determine the land's true value.) For economic activity to proceed as normal, the tenant leases the land that he/she needs from its owner, or the latter uses it directly. In both cases, the ground-rent is regularly returned to this land-lord, although in the second case the owner can be said to have self-leased it. Then the ground-rent is absorbed within this owner's business (or as a living-expense in the case of a privately owned residence), since the direct use of the land avoids the need for it to be leased elsewhere.

Suppose that a worker decides to exploit the utility of a relatively infertile and/or remote site, to the best of his ability. The productivity of this site is so low that the monetary value of the small amount of produce only just covers their production costs of wages, hire-fees, depreciation and maintenance. (These being the returns for use of the other two factors of production, the labour and the durable capital goods invested on the site). After an additional deduction for the cost of carrying the product to market and selling it, this site is incapable of generating any more income, in the form of rent. This land barely provides the worker with a living and the site has no micro-economic value, since in this mode of production nothing is left over. Hence, there will be no demand for the use of this land, which is of marginal utility, according to D. Ricardo's Rule of Rent [4].

However not all sites are so unproductive and the ground-rent varies with the quality of the natural resources available and their relationship to the centres of population. Consequently after the produce is sold, the site's ability to generate differing amounts of ground-rent is the measure of its "supra-marginal" utility, when expressed in practical terms. This surplus income is continuously generated on properly used sites, having their productivity above the marginal level. This occurs even after returning the larger amounts of wages and hire-fees, including depreciation and maintenance (to labour and capital respectively), that are duly combined for obtaining these sites' optimal utility. The added economic advantage to its user is thus expressed

by the amount of ground-rent that the site generates, which increases progressively with the more productive land.

Because some or all of this rent is not collected (and sent elsewhere), it also contributes to the business net yield. In fact, it is this difference in ground-rent that provides the motivation for establishing the industry or commerce in prosperous regions, where it is more worthwhile to produce the goods or services. However, the amount of rent that is charged for access to this land will reduce this economic advantage to the producer, especially if the actual utilization is less than optimum. After the sale of the produce and the return payments for the employment of labour and capital, it is the ability to generate ground-rent that endows the land with its utility-value, which offers a welcome opportunity to be explored by both the land-lord and the production manager.

Land that is used for commerce also falls within this class. Whether it is occupied by shops, offices, restaurants or other kinds of business, the advantage of its more-central location is taken so as to obtain the full utility, with the optimum amounts of man-power and capital investment being employed. The same principle also applies to residential land as described above. Except in the public sector, for all other land classes it is by means of the ground-rent alone that "supra-marginal" utility relates to the land-value itself.

G.2.6 The Relationship between Ground-Rent and the Utility Land-Value

The utility value of the land area may be determined by comparing its ground-rent to the average yield obtainable from an equal money investment, put into durable goods acting as capital. This latter investment provides a dividend, after subtracting the rates of depreciation and maintenance from the business net yield. Alternatively, the comparison can be based on the dividend-rate obtainable from shares in public companies that efficiently use such goods. The numerical comparison is made by taking the ratio of the ground-rent and the associated land-value and equating it to the average dividend-rate on capital investment. Then the land-value equals its ground-rent divided by this dividend-rate (see Table G.3, line 5b). The utility land-values determined in this manner may be described as the "capitalized" ground-rents. Due to the dynamic nature of the macro-economy, fluctuations will occur in the rate of return on capital investment. These changes cause the relationship between the values of land and of shares in a productive process, to vary in a complicated manner. However, on average over a period of time, this method provides the best means for the accurate assessment of the land-value.

Locally, similar sites of equal size and utility are able to command roughly equal ground-rents and land-values, due the pressure of competition bringing them within a small range of differences. The slight advantage or disadvantage in utility of one site relative to the others ensures that the resulting price variations keep them all at a realistic level. This principle does not only apply to productive land, the utility value of residential land is also be regulated by this natural method of value-judgment.

G.3 <u>THE COMPARISON BETWEEN GROUND-RENT AND THE RETURN ON CAPITAL</u>

When an investor purchases an area of land with buildings/installations that are intended for use in a productive, commercial or domestic economic role, he does so as if it were a single item of capital. However some confusion can arise, when he determines the value of the land together with the various possible installed industrial plants, manufacturing facilities, shops, offices, restaurants, residences, etc. Although he treats them as one, as seen above, their values actually arise from different causes. In addition to the economic ground-rent, the monetary return (or the hire-fees, that are demanded of the tenant) for the use of the various kinds of durable capital goods, all will appear to our investor/capitalist to be a part of the total annual effective utility income of the property.

So far in our analysis, only the land-value itself has been considered, without the value of the capital invested in buildings and installations. But because the land is often treated as if it were capital, it is easy to omit this essential difference. Due to this oversight, many writers in macroeconomics imply that capital in the form of land is no different from the capital invested in durable goods. They fail to recognize the fact that the value of the land does not originate from the exertion of direct labour on it and consequently that it is not really capital at all. Nor do they admit, when the macro-economy is modelled for purposes of dynamic analysis, that the different behaviour of these two entities must be properly represented. A comparison of the two is therefore presented in Table G.3, showing the differences in their behaviours.

Unlike every other item of manufactured goods on which work must first be performed in order to impart worth, it is not due to this measure that the basic value of land is created. (Although in an exceptional case described in section G.2.4, where increases in the land-value occur after the utility is raised by directly working certain poor kinds of agricultural land.) Fluctuations in the maximum ground-rent that normally that can be charged, result in variation of

the land-values, but these do not necessarily parallel the gain from and value of the equivalent sums used for capital investment in durable goods.

The reason for this general disparity between land and capital is due to the history of the land tenure within the country. Not every nation takes the same attitude to land ownership. For example, in Australia the Aboriginal natives envisage themselves as living in respectful partnership with the land, as if they were its common heritage (rather than the reverse, which they find difficult to understand or possibly to be of less significance!).

TABLE G.3 COMPARISON BETWEEN THE MACRO-ECONOMIC PROPERTIES OF: LAND AND ALL NATURALRESOURCES, WITH CAPITAL INVESTED AS DURABLE GOODS IN PRODUCTION FACILITIES		
MACRO-ECONOMIC PROPERTY	LAND AND NATURAL RESOURCES	CAPITAL DURABLE GOODS (PRODUCTION FACILITIES)
1. EXISTENCE DUE TO:	Creation or Gift of Nature.	Human exertion (labour).
2. POSSESION BY:	Land-Lord.	Capitalist (shareholder).
3. ECONOMIC ADVANTAGE:	Access/property rights (for unspecified use).	Use of the faculty (for a dedicated purpose).
4. ECONOMIC ANNUAL RETURN FOR THE USE OF ITS UTILITY:	The Ground-Rent, (not all of which goes to the land- lord, because without this advantage it tends to drive industry away from the populated regions).	Dividend = (Annual value of produce – Ground-Rent – Wages) – Depreciation and Maintenance of the facilities. (The first three terms on the right- hand side comprise the yield.)
5. EFFECTIVE VALUE DUE TO: a) Supply (cost).	Natural bounty remaining, together with the ease of communication to the centres of population.	Costs of the facilities' manufacture and installation = Build-Time x (Rent+Wages + Hire of Tools etc.) + Assigned Durable Capital Goods.
b) Demand (price).	"Capitalized" Ground-Rent = $\dfrac{\text{Gound-Rent}}{\text{Dividend Rate}}$	Productive capacity of the facility, when it is used efficiently in its dedicated role for many years.

TABLE G.3 (Continued) COMPARISON BETWEEN THE MACRO-ECONOMIC PROPERTIES OF: LAND AND ALL NATURAL RESOURCES, WITH CAPITAL INVESTED AS DURABLE GOODS IN PRODUCTION FACILITIES		
6. DYNAMIC EFFECTS: a) Use. The scarcity of raw materials, loss in fertility, quality, corrosion wear etc.	Reduced value, eventually followed by a changed land status and its speculative rise due to line 6b) below.	None, since depreciation causes and is deliberately allowed to reduce the value, with a tendency for production to move elsewhere after a long time.
b) Increase in the surrounding population-density.	Increased value, due to local developments improving the ease of communication.	Reduced value, due to need to invest in greater control of damage done to the environment and the resulting rise in production costs.
c) Greater "Prime-Rate" and the general rate of interest on all kinds of investment.	Reduced value due to capitalization formula, in line 5b) above.	Slightly increased value, due to trend for yield to equilibrate with dividend and Prime-Rates, because of "sensible" stock-market effects.
d) Greater extent of monopolization of the resource or facility.	(i) Increased value, from speculative price rise, (ii) exaggerated ground-rent and the resulting unemployment, from smaller opportunities for labour to be worthwhile (iii) greater urban sprawl, due to rise in values and the public-funded development of access to more-remote sites.	(i) Temporary increased value, from price speculation in the stock-market, followed by a drop in value, (ii) increased local unemployment, due to the raised (and reduced competitive) price of the product, causing a smaller demand, (iii) tendency for the consumer to substitute an alternative kind of goods to satisfy his needs.
e) Long-term source of funds for investment.	Trade in speculative price.	Unknowing use of ground-rent, by the land-lords who act as capitalists here.

G.4. SUMMARY AND CONCLUSIONS

a) The exchange-value of a site is determined on the free-market. This value depends on the use to which the site can be put. These prospects fall into various categories, for the production of goods and services, commerce, residence, recreation, military and government. They lie within rural, urban or national (public) land classifications, see Table G.1. The status of each site changes with time, see item g) below.

b) The opportunity offered by the land for its utility, is created by a combination of its natural resources and its proximity to the centres of population. These two kinds of factors are listed in Tables G.2a and G.2b. Both of them are needed for the utility to exist, the amount of which is found when they are combined (or multiplied together).

c) The ground-rent of the site is the regular sum that the land-using tenant is willing to pay, for the right of access for optimum use. Consequently, ground-rent is also the excess product (or greatest enjoyment, in the case of residential land), over that offered by the least useful (or marginal) land. This is Ricardo's Rule of Rent [4]. The ground-rent is the practical measure of the amount of land utility that lies above this margin.

d) Land in productive, commercial or residential use has a value that can be found by dividing the annual ground-rent by the dividend rate on shares in a business concern. This rate is also the average yearly return on capital investments in durable goods, after deducting the cost of maintenance and depreciation.

e) Providing that its status is unchanged, the value of public land is indeterminate and of no significance to the macro-economy.

f) The value of the land should not be confused with the value of the invested durable capital goods, which are installed on it. The generation of the ground-rent from the land is by a different process than that of the hire-fees obtained from using these durables. (There are a few minor exceptions to the land-value being independent of capital investment, never-the-less in general this is true.)

g) When the status of an area of land is expected to improve, there is a strong tendency for speculators to take advantage by purchasing it and then restricting its use. The resulting monopolization limits the amount of

land available and it inflates the amount of ground-rent that tenants of the other sites must pay. This makes it more costly to produce goods, reducing the extent of their consumption and increasing the degree of unemployment and poverty. Also, the effect of land speculation is to drive production, commerce and residence to the marginal regions, to worsen urban sprawl and to increase unemployment, see Table G.3. This causes the phenomenon of stagflation.

h) After due consideration is given to the value of the land, a picture emerges of a natural phenomenon that behaves according to certain rules that are similar to the laws of physics. Hence, this aspect of macroeconomics is scientific.

CONSEQUENTIAL MACROECONOMICS

INDEX